

# HP Basic Instruments Catalog

H P D I R E C T

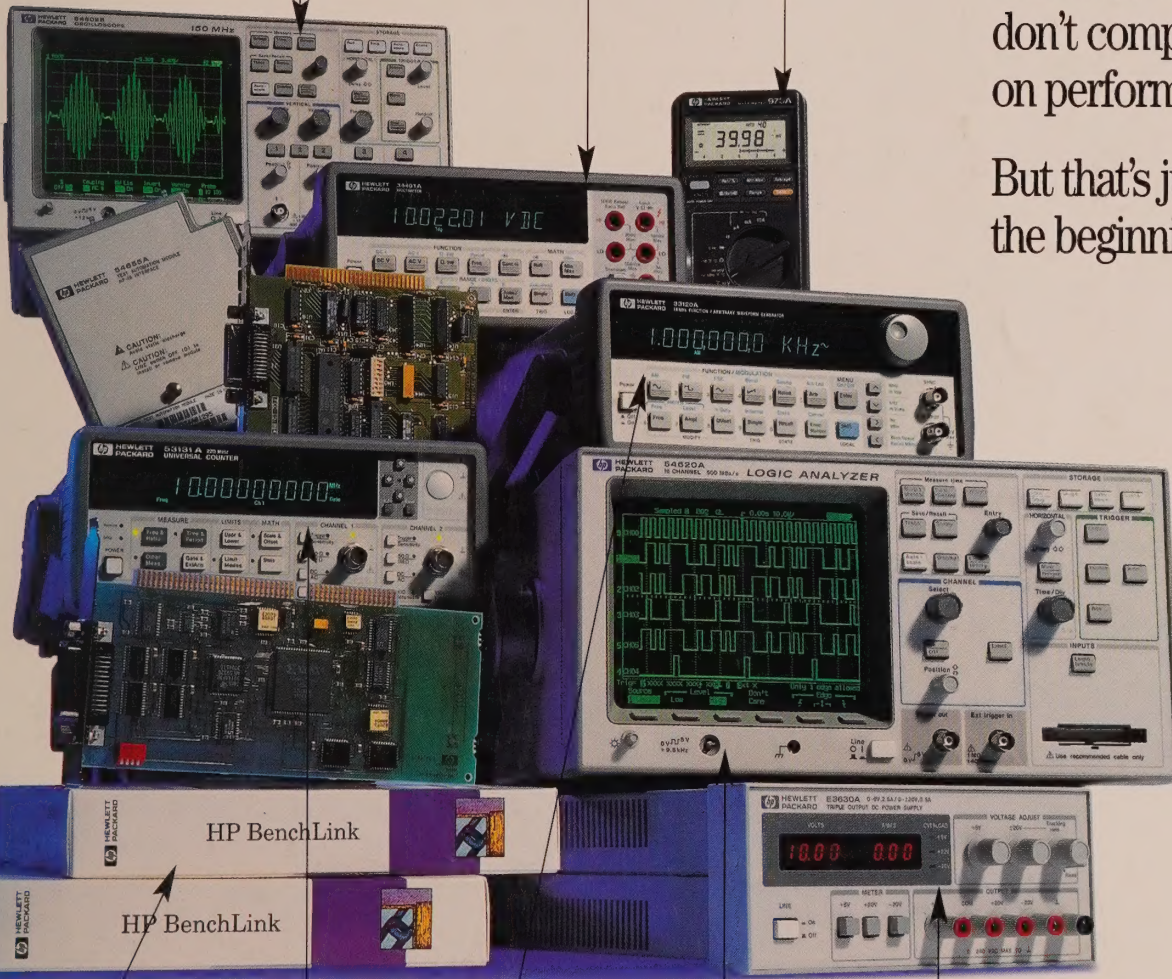
Practical,  
value-priced  
instruments that  
don't compromise  
on performance.

But that's just  
the beginning.

Scopes with the feel of analog  
and the power of digital.  
On page 2.

A 6½ digit DMM at a  
5½ digit price.  
Page 16.

Handheld multimeters  
with benchtop features.  
See page 18.



HP BenchLink

HP BenchLink

Software that  
simplifies testing,  
analysis and reporting.  
Page 40.

Counters with up to  
12 digit/second  
frequency resolution.  
Page 22.

Arbitrary waveform  
capability in a low-cost  
function generator.  
See page 24.

Untangle digital circuits  
with a logic analyzer that  
runs like a scope.  
See page 11.

Clean power you'd  
never expect from a  
benchtop supply.  
Take a look at page 29.



# We're going to show you a commitment to basic instruments you've never seen before. From anyone.

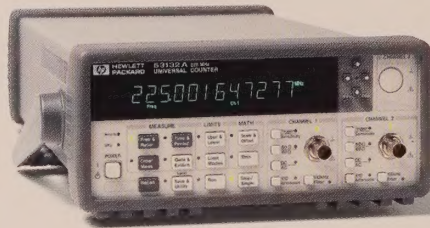
**L**ET'S START our relationship with something you don't always get: total candor.

The truth is, we know you don't always think of Hewlett-Packard when you make a basic instrument purchase. And we know why. Because we've historically been a company that has focused almost exclusively on costlier, high-performance products.

That's changed.

Now we're offering something you won't get from any other test and measurement company: an organization within HP whose sole reason for existing is to provide you with better basic instruments and services than you can get anywhere else.

Exactly what does this mean to you? Now, even though you're on a tight budget, you don't have to sacrifice functionality, quality, or excellent customer service. You can get everything you deserve — from a company with 55 years of leadership in test and measurement.



**We borrowed technology from the world's best high-performance products.**

Our design team borrowed innovative technology developed for HP's line of high-end modulation domain analyzers to develop the new HP 53132A universal counter. The result? The project team

increased measurement speed significantly and reached their goal of making the counter perform frequency measurements with up to 12 digits in one second. It's just one example of how we leverage high-end technology into basic instruments. Get the details on the HP 53132A on page 22.

**You said your needs had changed, so we changed our instruments.**

If HP DIRECT customers have one thing in common, it's a willingness to tell us what's on your mind. From systematic research to simple one-on-one conversations, we get plenty of feedback, sometimes positive, sometimes not so positive. One recent theme: you need to troubleshoot increasingly complex digital circuits, but you don't have the time or patience for traditional logic analyzers. That's why we created the very nontraditional HP 54620A logic analyzer, which delivers comprehensive timing analysis on 16 channels but is as easy to run as your familiar scope. Find out more on page 11.



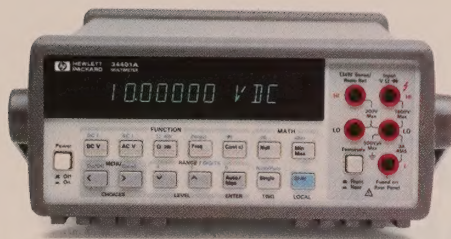
## Within budget, without compromise.

All instruments in this catalog are manufactured at sites that have been ISO-9002 certified and are CFC-free.



**We realized that designing in more performance is only half the challenge.**

Make as many test instruments as we do and you learn some tricks about manufacturing efficiencies. A case in point is our remarkable HP 34401A digital multimeter. We began by greatly reducing the number of hand-assembled parts. An innovative terminal block simply snaps into place. And two new HP-designed ICs replace more than 55 other parts. Our ability to cut assembly time from 20 to 6 minutes helped us reduce cost. The result? A DMM that costs only two-thirds as much as others in its class, yet offers greater accuracy and more capabilities. For more, see page 16.



**We make the equipment you already own work harder for you.**

These days you don't have the luxury of buying a new scope every time your needs change. So wouldn't it be great if you could just buy one scope, then affordably add capabilities to it whenever you need them? That day arrived when we took a radical

new approach to scope design. By popping on a module, you can transform your HP 54600-series scope into a versatile test and measurement station. It's easy to add direct hard copy, PC connectivity, remote control, advanced measurement capabilities such as FFT, and benchtop automation. Find out more about HP 54600-series modules on page 6.

**We give you telephone access to some of our best engineers, so you can always make the smartest decision.**

One call to HP DIRECT can put you in touch with experienced engineers who have been solving measurement problems like yours for years, and who know basic instruments inside and out. They can answer your toughest questions, send you technical literature, or help you with a specific measurement problem. You'll like working with them because they're not there just to help you make purchases, but to help you make smart decisions. HP DIRECT is the easiest, most convenient way to handle all of your basic instrument needs. For all the details, see page 26.



*Get more information on how Hewlett-Packard is providing products that are "within budget, without compromise." Call HP DIRECT at 1-800-452-4844 and ask for our brochure — "The Inside Story" (HP pub. #5962-7101E).*

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## HP 54600-series scopes

# The feel of analog and the power of digital.

Digital scopes used to present a dilemma. Most engineers and technicians appreciated the performance and analysis benefits that only digital could provide, but they didn't want to give up the comfortable look and feel of analog scopes.

With the HP 54600-series scopes, that dilemma disappears. We wrapped the hands-on feel of analog around the power of digital processing, so you no longer have to choose one or the other.

**Start with what you love about analog.**

When you're troubleshooting, you want to stay focused on two things: the circuit and the display. You don't want to waste time punching buttons or waiting for the scope to update. That's why the straightforward front panels and real-time display response of analog scopes made them such vital pieces of equipment.

You'll feel right at home with the HP 54600-series digital scopes because they preserve the easy usability of analog. Front-panel knobs look and work just like the knobs on your old analog scope. You don't have to change the way you work, which means you won't lose time getting used to a new style of test equipment.

An update rate of 1.5 million points per second or 60 screens per second (vectors on mode) means these scopes respond instantly. When you make a change on the front panel, or your input signal changes, you'll see the results without delay.

The new real-time vector display

You'll love using these scopes.

1-800-452-4844

HP 54600-series starts at \$1,995

mode on the HP 54600-series makes your signal even easier to see. Slowly changing portions of waveforms appear brighter on the display, while rapidly changing portions appear dimmer. No

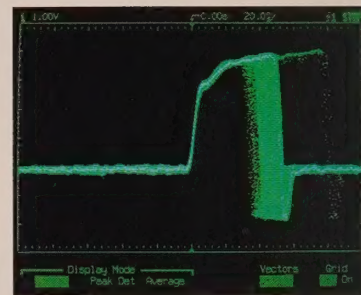
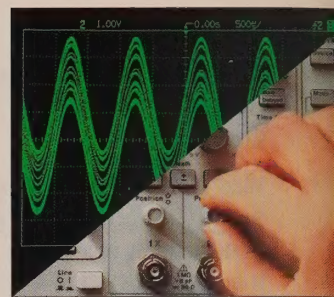
other digital scopes produce waveforms that provide this much visual information or look this close to analog.

**Add the punch of digital.**

Why put up with faint traces or flickering displays? These digital displays are bright and stable, so there's no squinting, no need for a viewing hood, no more headaches.

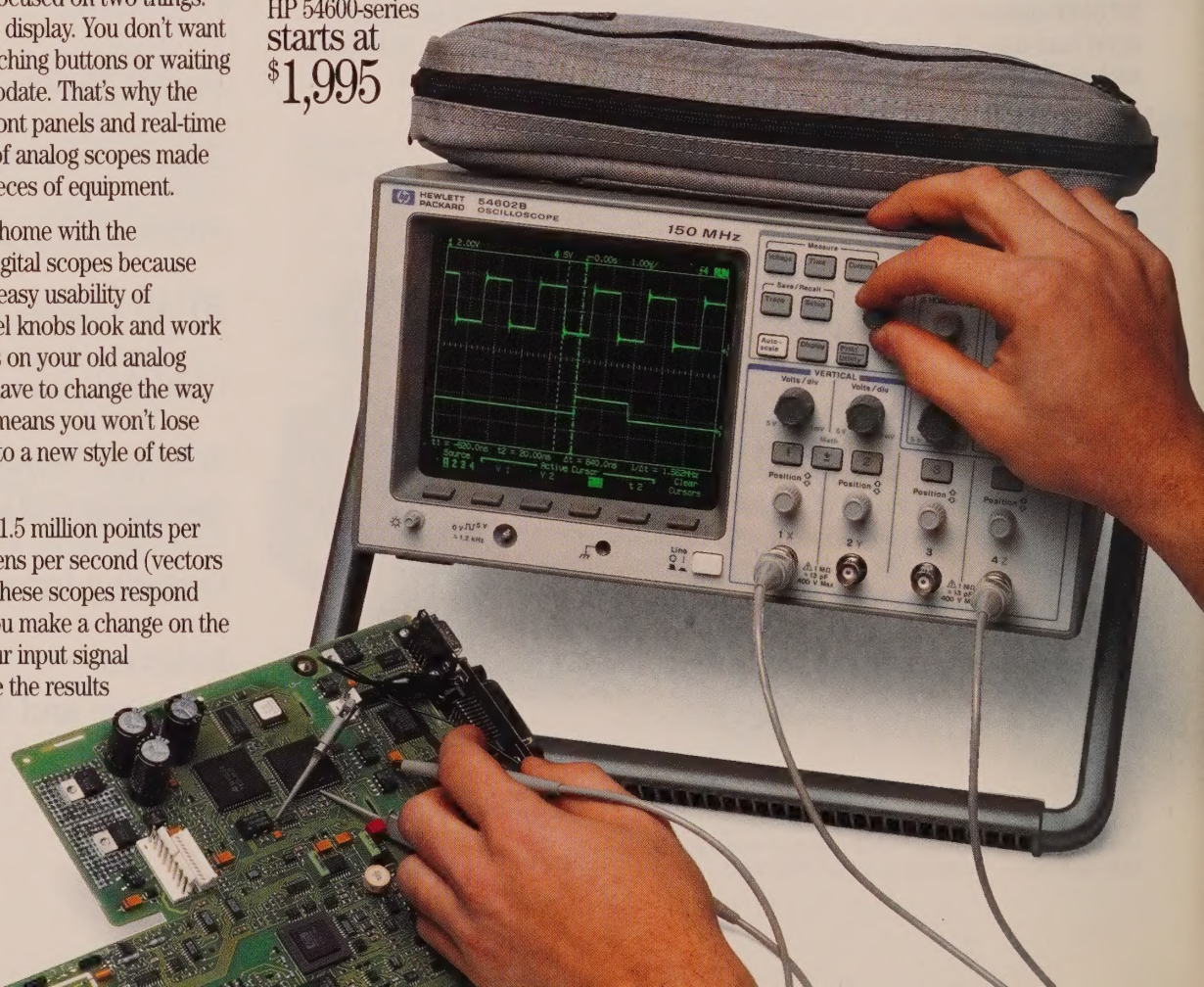
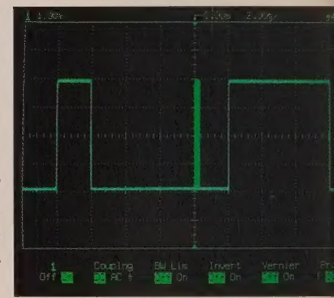
You'll see what you need to

Turn a control knob and your scope reacts instantly.



Autostore shows you signals you can't even see on an analog scope.

Real-time vector display and storage capture glitches other scopes miss.





see, across a wide range of sweep speeds and input frequencies.

The power of digital opens up entirely new possibilities, such as pretriggering. Pretriggering lets you look back in time to see what was going on before the trigger event occurred.

Precise, dependable results are yet another benefit. With timebases of 2 ns/div (HP 54600B/01B/02B) or 1 ns/div (HP 54610B), you'll get more insight into waveform details. (Even the budget-priced HP 54603B offers a timebase of 5 ns/div — twice the speed of a leading competitor costing hundreds of dollars more.) Plus, horizontal accuracy of  $\pm 0.01\%$  delivers more dependable results than analog scopes. Now you can measure critical timing specs more accurately and, using the 1 ns/div timebase of the HP 54610B, catch the fast edges of ECL.

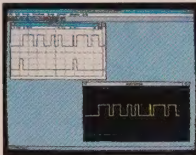
#### Seeing and storing your toughest signals.

The definition of good test equipment is that it helps you get your job done easier and faster.

- Autoscale frees you from resetting the scope every time you move the probe from test point to test point. Simply hit the Autoscale button, and it sets voltage, time and trigger parameters for you, almost before your finger is off the button.
- With autostore, the current waveform displays at full brightness while previous waveforms stay on the screen at half brightness, so it's easy to see history and the current trace at the same time.
- When you're doing a slow sweep, peak detect helps capture fast transient events you might otherwise miss.
- With the speed to catch repetitive signals at up to 10 GSa/s (and single-shot signals at up to 20 MSa/s), you'll get a complete picture of what's happening in your circuits.

#### Your analysis doesn't have to end with a trace on the display.

With HP 34810A BenchLink/Scope, it's easy to move data from your scope to a PC and take advantage of all the analysis, documentation, and presentation tools offered in Microsoft Windows.



Microsoft Windows is a U.S. trademark of Microsoft Corporation.

*Interested in a low-cost way to boost your scope's performance and your own productivity? Page 6 shows how easy it is to add enhancement modules, and page 40 explains how HP BenchLink/Scope lets you quickly move data and screen images from your scope to your PC — with no programming!*



## The power behind the performance.

Catching fast transients and updating 1.5 million display points every second are not jobs for an ordinary oscilloscope. Performance at this level demands a high-throughput architecture that moves data and control signals without delay.

The HP 54600-series scopes achieve this level with the help of two custom processors that work in tandem with the main processor. One manages data collection and placement mathematics, and the other is dedicated to display processing and waveform imaging functions.

With these two processors handling data, the main processor is free to take care of the front panel. By managing all these tasks in parallel, the digital electronics in the HP 54600-series boost both performance and responsiveness. It's another great example of superior engineering creating high-value products.

## Within budget, without compromise.

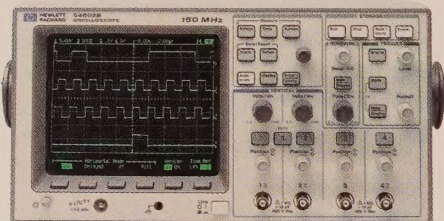
*See pages 4 and 5 for the full selection of HP 54600-series scopes.*



## HP 54600-series scopes

# A scope that's ideal for your application and budget.

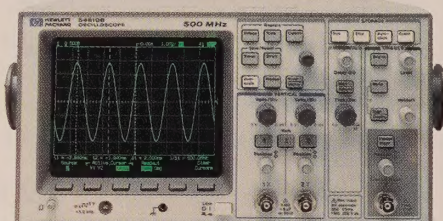
One message always comes through loud and clear from our customers: you're tired of having to choose between excellent features and performance and a reasonable price. You want it all.



### HP 54602B

- 150 MHz bandwidth
- 4 input channels
- Sweep speeds from 2 ns/div to 5 s/div
- \$3,395

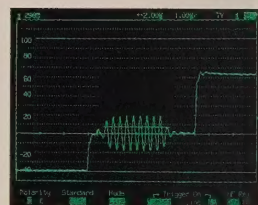
For a high-quality lab scope when your needs go past 100 MHz, take a closer look at the HP 54602B. You get the same capabilities as the other HP 54600-series scopes, with the added advantage of a 150 MHz bandwidth and 1 mV/div sensitivity.



### HP 54610B

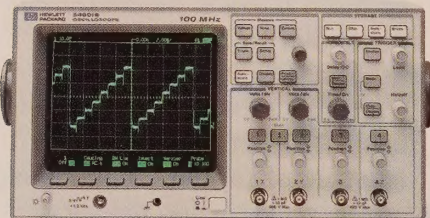
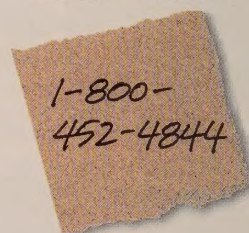
- 500 MHz bandwidth
- 2 input channels plus trigger view
- Sweep speeds from 1 ns/div to 5 s/div
- \$4,995

Need accurate 500 MHz measurements on a tight budget? We had you in mind when we designed the HP 54610B. With its horizontal accuracy of  $\pm 0.01\%$  and 1 ns/div timebase, you know you'll catch the critical details.



If you're testing TV or video with the HP 54602B or HP 54610B scopes, you'll really want to see our powerful enhanced TV/video trigger Option 005.

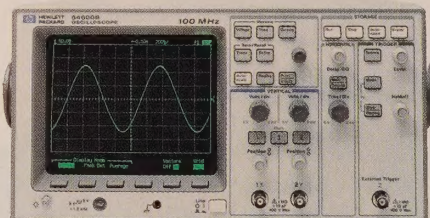
High performance  
at a price you wouldn't expect.  
Call HP DIRECT.



### HP 54601B

- 100 MHz bandwidth
- 4 input channels
- Sweep speeds from 2 ns/div to 5 s/div
- \$2,995

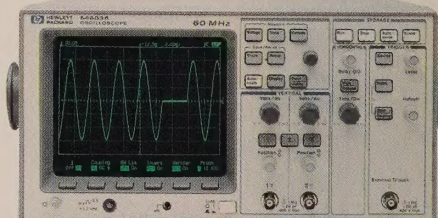
The HP 54601B offers tremendous value in a low-cost four-channel scope. When you need the added productivity and insight that come with four measurement channels, the HP 54601B offers an attractive blend of performance and capability.



### HP 54600B

- 100 MHz bandwidth
- 2 input channels
- Sweep speeds from 2 ns/div to 5 s/div
- \$2,495

The HP 54600B is ideal for production test, field service, and education, where you need solid, dependable scopes at a low price. With prices this low, you can afford to equip your staff without sacrificing measurement capability or confidence in the results.



### HP 54603B

- 60 MHz bandwidth
- 2 input channels
- Sweep speeds from 5 ns/div to 5 s/div
- \$1,995

Equipping a lab under tight budget restrictions used to mean giving up quality and capability. Not anymore. The HP 54603B delivers the features and performance you've always wanted. For colleges and universities, this scope is a great way to introduce students to the world of professional test equipment.



**HP 54600B, HP 54601B, HP 54602B, HP 54603B and HP 54610B Oscilloscopes**

	HP 54603B	HP 54600B	HP 54601B	HP 54602B	HP 54610B
<b>Bandwidth</b> CH 1 & 2 ac coupled CH 3 & 4	dc-60 MHz 10 Hz-60 MHz NA	dc-100 MHz 10 Hz-100 MHz NA	dc-100 MHz 10 Hz-100 MHz dc-100 MHz	dc-150 MHz* 10 Hz-150 MHz* dc-250 MHz	dc-500 MHz 10 Hz-500 MHz NA
<b>Single-shot bandwidth</b>	dc-2 MHz				
<b>Number of channels</b>	2	2	4 (2 + 2)	4 (2 + 2)	2
<b>Sensitivity</b> CH 1 & 2 CH 3 & 4	2 mV/div to 5 V/div NA	2 mV/div to 5 V/div NA	2 mV/div to 5 V/div 0.1 & 0.5 V/div	1 mV/div to 5 V/div 0.1 & 0.5 V/div	2 mV/div to 5 V/div NA
<b>dc gain accuracy</b>	±2%	±1.5%	±1.5%	±1.5%	±2%
<b>Vernier accuracy</b>	±3%	±3%	±3%	±3%	±2%
<b>Rise time (calculated)</b> CH 1 & 2 CH 3 & 4	<5.83 ns NA	<3.5 ns NA	<3.5 ns <3.5 ns	<2.33 ns <1.4 ns	<700 ps NA
<b>Input impedance</b>	1 M $\Omega$ , approx. 13 pF	1 M $\Omega$ , approx. 13 pF	1 M $\Omega$ , approx. 13 pF	1 M $\Omega$ , approx. 13 pF	1 M $\Omega$ , approx. 8 pF or 50 $\Omega$ selectable
<b>Input coupling</b> CH 1 & 2 CH 3 & 4	dc, ac or ground NA	dc, ac or ground NA	dc, ac or ground dc, ground	dc, ac or ground dc, ground	dc, ac or ground NA
<b>Maximum input (dc + peak ac)</b>	400 V	400 V	400 V	400 V	250 V or 5 Vrms in 50 $\Omega$ mode
<b>Timebase range (main &amp; delayed)</b>	5 s/div to 5 ns/div	5 s/div to 2 ns/div	5 s/div to 2 ns/div	5 s/div to 2 ns/div	5 s/div to 1 ns/div
<b>Trigger sources</b>	CH 1, 2, line or ext.	CH 1, 2, line or ext.	CH 1, 2, 3, 4 or line	CH 1, 2, 3, 4 or line	CH 1, 2, line or ext.

**HP 54600-series family**

<b>Accuracy</b>	±0.01%
<b>Vernier accuracy</b>	±0.05%
<b>Resolution</b>	100 ps
<b>Trigger sensitivity</b> dc to 25 MHz dc to max. bandwidth	0.35 div or 3.5 mV 0.35 div or 3.5 mV**
<b>Maximum sample rate</b>	20 MSa/s single shot, 10 GSa/s repetitive
<b>Record length</b>	4,000 points (2,000 points single-shot or vectors on)
<b>Resolution</b>	8 bits
<b>Max. display update rate</b>	1,500,000 points/sec
<b>Power</b>	Voltage: 100-240 Vac, 48-440 Hz, 220 VA maximum
<b>Net weight</b>	Approx. 6.2 kg (14 lbs)
<b>Size (excl. handle)</b>	172 mm H x 322 mm W x 317 mm D (6.8 x 12.7 x 12.5 in)
<b>Warranty</b>	3 years

**Ordering information**

HP 54600B Two-channel 100 MHz oscilloscope	\$2,495.00 ea.	090 Delete probes (HP 54600/01/02/03B)	-\$112.00 ea.
HP 54601B Four-channel 100 MHz oscilloscope	2,995.00 ea.	090 Delete probes (HP 54610B)	-306.00 ea.
HP 54602B Four-channel 150 MHz oscilloscope	3,395.00 ea.	101 HP 10098A Accessory pouch and front panel cover	51.00 ea.
HP 54603B Two-channel 60 MHz oscilloscope	1,995.00 ea.	102 2 addl. HP 10071A probes (HP 54601/02B)	112.00 ea.
HP 54610B Two-channel 500 MHz oscilloscope	4,995.00 ea.	103 HP 54654A Operator's training kit	204.00 ea.
<b>Options</b>		104 5041-9409 Carrying case	210.00 ea.
001 RS-03 Magnetic interference shielding added to CRT	102.00 ea.	1CM 5062-7345 Rack mount kit	250.00 ea.
002 RE-02 Display shield added to CRT to reduce radiated interference	355.00 ea.	106 HP 34810A BenchLink/Scope software (Windows)	295.00 ea.
005 Enhanced TV/video triggering (HP 54602/10B)	510.00 ea.		(can also be ordered separately as HP 34810A)
Trigger on specified video line number		W50 Additional 2-year warranty, available for HP 54600-series oscilloscopes starting at†	60.00 ea.
Full bandwidth vertical cut on rear panel			

\* Maximum bandwidth on CH 1 & 2 is 100 MHz at 1, 2, and 5 mV/div.

\*\* For HP 54602B, sensitivity between 25 MHz and max. bandwidth on CH 1 & 2 is 1.5 div or 3 mV at 1, 2, and 5 mV/div.

† Call HP DIRECT for more information.

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I'll help you get the right scope.

You rely on your scope day in and day out, so you need an instrument that meets your needs in terms of both features and performance.

I know HP's scopes inside and out, and I know how they compare to other scopes on the market. Give me a call and let's discuss your applications. We'll make sure you get enough capability without paying more than you should. I can also help you pick out the right accessories, from cables to performance-enhancement modules.



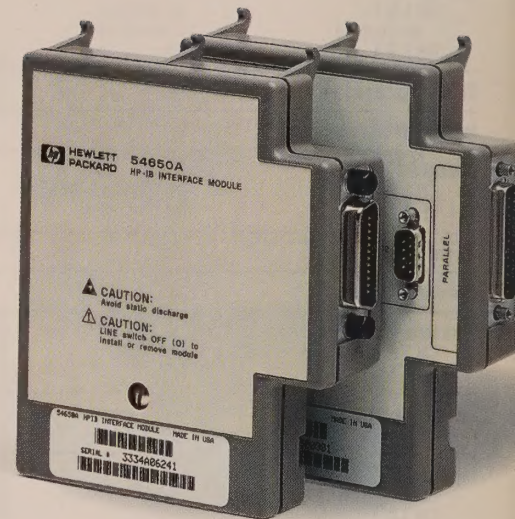
Call me with your toughest scope questions.

**1-800-452-4844**



# Boost scope performance without breaking your budget.

Modules range from **\$280** to **\$815**



Now upgrading your scope is easy — and easily affordable.

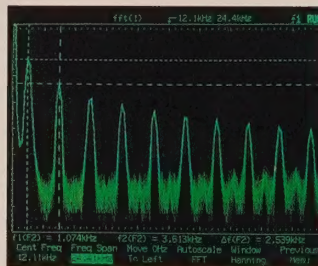
Transforming your HP 54600-series scope into a versatile test and measurement station is now as simple as popping on a module. It's easy to add direct hard copy, PC connectivity, RS-232 and parallel ports (depending on model), remote control, and advanced measurement capabilities such as fast Fourier transforms (FFT) and benchtop automation. You'll solve problems and boost productivity in ways that just aren't possible with ordinary scopes.

## Put extra troubleshooting power in your lab.

For high-performance tools usually found only in much more expensive scopes — including the FFT to view signals in the frequency domain — add the HP 54657A (HP-IB) or HP 54659B (RS-232 and parallel) measurement/storage module. Common problems that are difficult or impossible to see in the time domain (such as harmonic distortion) are much easier to analyze in the frequency domain.

Get more from your oscilloscope.

1-800-452-4844

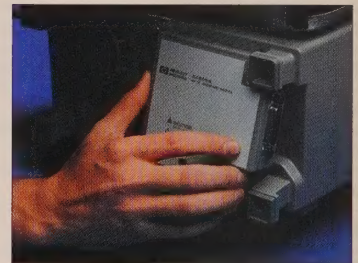


Turn on FFT, check in the frequency domain, and track down the cause of circuit failures.

## Catch those intermittent failures.

With this module's unattended signal monitoring and failure detection features, you simply set up the scope and walk away. It will monitor the signal by comparison to a waveform mask template. When the failure mode appears, the scope will capture the signal and follow your instructions for time stamping, printing or storing the signal for later analysis.

The measurement/storage module provides other features to make your work easier, including measurements of channel-to-channel delay and phase, user-definable voltage levels for timing measurements, and extended math functions and cursor readouts.



Add remote control and connectivity, including a PC link to use HP's BenchLink/Scope.

## Put system-style automation on your benchtop.

Think of how much time you'd save if you could program a scope to perform repetitive tasks at the touch of a button.

The HP 54655A (HP-IB) or HP 54656A (RS-232) test automation module makes it easy to set up automated tests — and you don't need a computer to do it. A built-in mask generator and editor lets you create a test routine of up to 100 steps. You can even use branching on pass/fail conditions to guide the operator through troubleshooting.

If all you need is an interface, add HP-IB with the HP 54650A, RS-232 with the HP 54651A, parallel with the HP 54652A, or both RS-232 and parallel connections with the HP 54652B.



## Modules: the right product for your test environment.

Budgets are getting tighter but the pace of the 1990s hasn't slowed a step. The bottom line is you have to do more with the same resources as last year.

Add-on modules for the HP 54600-series scopes are another way HP is working to expand your resources without breaking your budget. Modules keep high performance affordable, whether you're buying a new HP 54600-series scope or upgrading an existing one. You can buy the scope with confidence, knowing that you can expand its capabilities as your needs grow.

Give HP DIRECT a call, and we can tell you how to get more from less. We have a lot of hours in front of scopes ourselves, and we've helped customers with all kinds of scope applications. We'll show you how to maximize the performance and capability of your HP 54600-series scope — and make sure you get the right combination of modules and accessories.

### HP 54600-series Scope Interface and Enhancement Modules

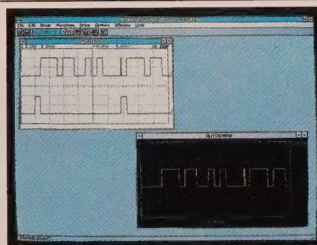
#### Ordering information

Product*	Description	Price
HP 54650A	HP-IB Interface module	\$485.00 ea.
HP 54651A	RS-232 Interface module	485.00 ea.
HP 54652A	Parallel Interface module	280.00 ea.
HP 54652B	RS-232 & Parallel Interface module	485.00 ea.
HP 54655A	HP-IB Test Automation module	765.00 ea.
HP 54656A	RS-232 Test Automation module	815.00 ea.
HP 54657A	HP-IB Measurement/Storage module	765.00 ea.
HP 54658A	RS-232 Measurement/Storage module	765.00 ea.
HP 54659B	RS-232 & Parallel Measurement/Storage module	765.00 ea.
HP 54653A	ScopeLink software for DOS	300.00 ea.
HP 34810A	BenchLink/Scope software for Windows	295.00 ea.

\*Modules with product numbers ending in "A" are compatible with HP 54600A-series and 54600B-series scopes. Modules ending in "B" are compatible with the HP 54600B-series only. (Note that the HP 54620A logic analyzer can use any of these modules, but it uses the modules for I/O only.)

Microsoft Windows is a U.S. trademark and MS-DOS is a registered trademark of Microsoft Corporation.

See page 43 for HP-IB and RS-232 cable needs.



To quickly move data and screen images to your PC, see the HP 34810A BenchLink/Scope software on page 40.

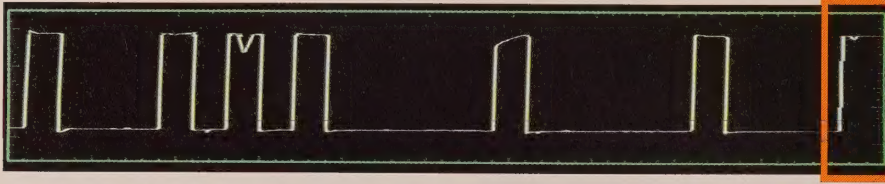
Need more on what modules will do for you? Call HP DIRECT.

**1-800-452-4844**

**Within budget,  
without compromise.**



# See the problems other 500 MHz scopes miss.



Scopes with inadequate memory show you only a small fraction of what you'll see with the HP 54520A or HP 54540A.

## Find out what's really happening inside your circuits.

Is your scope telling you the whole story? If it's short on speed or memory, you're not going to get a complete and accurate view of the signals in your digital designs.

With 32 K memory per channel, the two-channel HP 54520A and the four-channel HP 54540A let you maintain higher resolution over longer periods of time. You'll be able to see entire pulse trains and events with moderate frequencies but with fast edge rates.

The bottom line: you'll get the information you need to solve design problems faster and with greater confidence.

## Catch hard-to-find problems before they catch you.

For fast, complex circuits, you need a scope that's just as fast and twice as clever. When you're armed with 1 ns peak detect, 1 ns glitch triggering and sample rates up to 2 GSa/s, glitches will find it hard to hide.

Stop guessing where that signal is. Call:

1-800-452-4844

Consider the ways these scopes help you solve the tough ones:

- Long time records let you catch problems that occur before the trigger event.
- The 1 ns peak detect feature samples at a high rate even at slow sweep speeds, so narrow glitches are detected that normally would be missed.
- Min, max and average measurements help quantify measurement uncertainty. (You won't find this feature on most other scopes in this price range!)
- Sequential single-shot mode captures and time-tags successive pulses separated by long dead times.

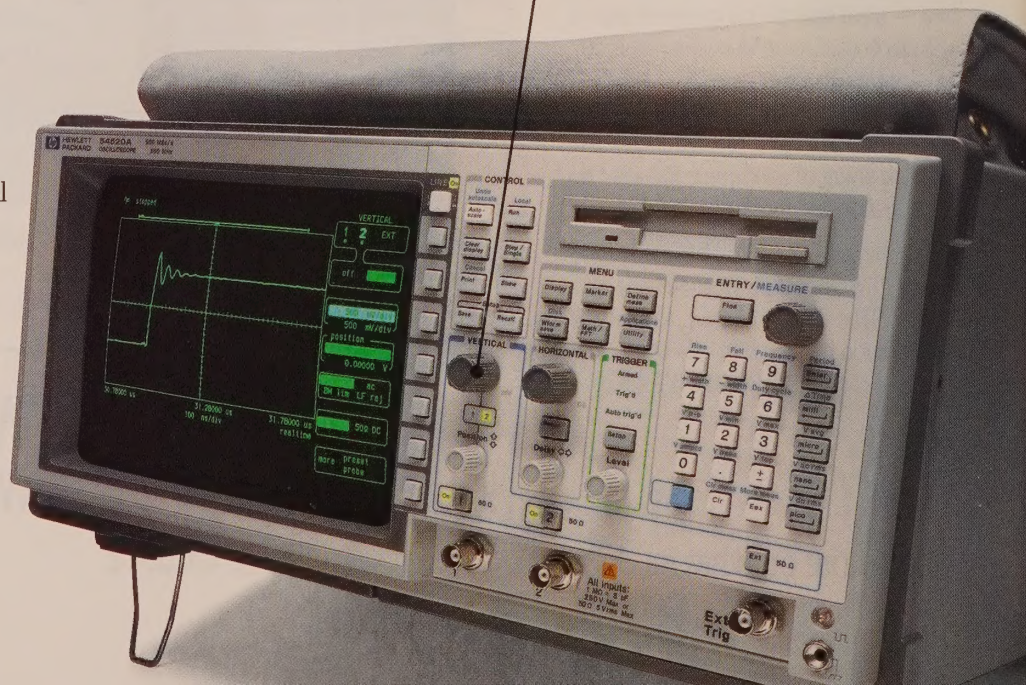
Plus, a comprehensive set of testing features lets you compare waveforms to a mask, perform limit testing, edit masks, and log failures to memory — all built into the scope.

## Choose the performance that meets your needs.

Giving you maximum value means letting you choose the right level of performance. The HP 54520A offers 500 MSa/s sampling on both channels and 1 GSa/s on one channel. The standard HP 54540A offers 500 MSa/s on four channels, 1 MSa/s on two channels, and 2 GSa/s on one channel. If you find you need more speed later on, both scopes can be upgraded to 2 GSa/s on all channels.

Control vertical sensitivity, timebase, and trigger level with familiar analog knobs.

\$9,500







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Get the latest information on  
HP basic instruments sent to  
you throughout the year.

See the attached business reply  
card for details.







## HP 54520A and HP 54540A Oscilloscopes

<b>Maximum sample rate</b>	
HP 54520A	1 GSa/s (1 ch on) 500 MSa/s (2 ch on)
HP 54540A	2 GSa/s (1 ch on) 1 GSa/s (2 ch on) 500 MSa/s (3 or 4 ch on)
<b>Record length</b>	
	32,768 pts (real-time) 501 pts (repetitive)
<b>Resolution</b>	
	8 bits (10 bits via HP-IB with averaging)
<b>Repetitive bandwidth</b>	
	500 MHz (equivalent time)
<b>Real-time bandwidth</b>	
HP 54520A	250 MHz (1 ch on) 125 MHz (2 ch on)
HP 54540A	500 MHz (1 ch on) 250 MHz (2 ch on) 125 MHz (3 or 4 ch on)
<b>Number of channels (all simultaneous)</b>	
HP 54520A	2
HP 54540A	4
<b>Sensitivity</b>	
	1 mV/div to 5 V/div*
<b>dc gain accuracy</b>	
	±1.25% of full scale
<b>Input impedance</b>	
	R: 1 M $\Omega$ , ±1% or 50 $\Omega$ , ±1% C: 7 pF nominal
<b>Input coupling</b>	
	ac or dc
<b>Maximum input</b>	
	1 M $\Omega$ : ±250 V (dc + ac) [ac < 10 kHz] 50 $\Omega$ : 5 Vrms
<b>Timebase range</b>	
	500 ps/div to 5 s/div
<b>Resolution</b>	
	10 ps
<b>Delta-t accuracy</b>	
Repetitive (≥8 averages)	±[(0.005%)( $\Delta t$ ) + (100 ps + 0.1% of full scale)]
Real-time**	±[(0.005%)( $\Delta t$ ) + (0.2)(sample period)]
<b>Trigger sensitivity</b>	
Internal	dc to 100 MHz 0.5 div
External (HP 54520A)	0.0225 x (signal range)
	100 MHz to 500 MHz 1.0 div 0.045 x (signal range)
<b>Trigger pulse width (min.)</b>	
	1 ns
<b>Power</b>	
	Voltage: 115/230 Vac, -25% to +15%, 48 to 440 Hz, 350 VA max.
<b>Net weight</b>	
	Approx. 11.8 kg (26 lbs)
<b>Size</b>	
	218 mm H x 440 mm W x 367 mm D (8.6 x 17.3 x 14.5 in)
<b>Warranty</b>	
	3 years
<b>Ordering information</b>	
HP 54520A Two-channel 500 MHz oscilloscope	\$9,500.00 ea.
Opt. 090 Delete two probes	-340.00 ea.
Opt. W50 Additional 2-year extended warranty	240.00 ea.
HP 54540A Four-channel 500 MHz oscilloscope	15,000.00 ea.
Opt. 090 Delete four probes	-680.00 ea.
Opt. W50 Additional 2-year extended warranty	375.00 ea.
Opt. 908 Rack mount kit (HP 54520A/40A)	255.00 ea.
HP 10430A 1 m 10:1 1 M $\Omega$ probe	179.00 ea.
HP 10441A 2 m 10:1 1 M $\Omega$ probe	179.00 ea.

\*Magnification is used below 7 mV per division range.

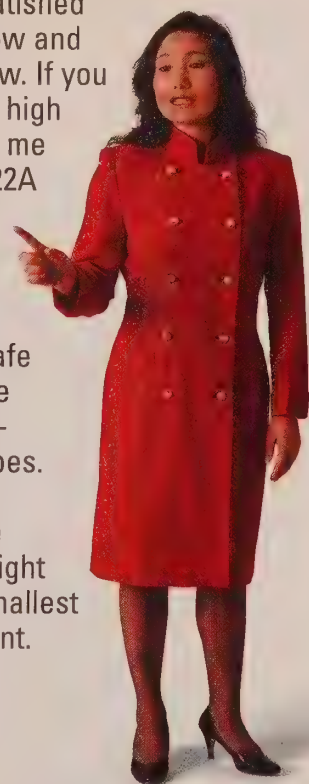
\*\*For bandwidth limited signals,  $tr \geq 1.4 \times$  sample interval.

The HP 54520A and HP 54540A come with two (HP 54520A) or four (HP 54540A) HP 10441A 10:1 1 M $\Omega$  probes, as well as a user's quick start, user's reference, programmer's reference, service guide, power cord, and three-year warranty.

## Finding the right scope isn't always easy.

As an engineer myself, I know how important a scope is to your success on the job. I'm here to make sure you have all the information you need to make the right choice. Call me today, and we'll discuss your applications, your budget, and your future needs. We'll combine what you know about your testing needs with what I know about HP scopes, and we'll be sure you get the right instrument.

A big part of my job is making sure you'll be a satisfied customer tomorrow and ten years from now. If you require extremely high sample rates, call me about the HP 54522A and HP 54542A scopes. I can give you all the information you need to make a safe purchase on these or any of our high-performance scopes. Whatever the situation, I'll make sure you get the right solution for the smallest possible investment.

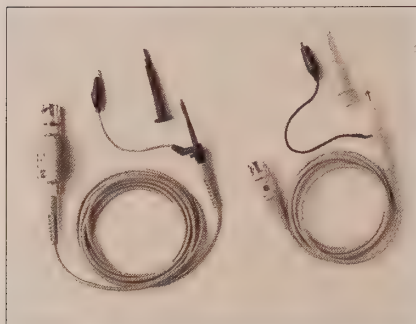


Let's talk about what you *really* need in a high-performance scope.

# 1-800-452-4844



# Great measurements start with great connections.



Connect to your circuits with top-quality probes.

Complete your test setup with probes designed specifically for your HP 54500-series or HP 54600-series scope. The HP 10400-series miniature probes combine low capacitance with high performance. The HP 10070-series are rugged general-purpose probes for the HP 54600-series

scopes. They offer 1:1 or 10:1 division ratios, as well as a 500 MHz probe designed for the HP 54610B scope. For high-voltage measurements, the HP 1137A handles up to 5 kV.

## HP Scope Probes

Product	Typical bandwidth	Length (incl. cable)	Division ratio	Input resistance	Approximate shunt capacitance	Scope compatibility	Price
HP 10070A	20 MHz	1.5 m	1:1	1 M $\Omega$	70 pF	HP 54600/01/02/03B	\$56.00 ea.
HP 10071A	150 MHz	1.5 m	10:1	10 M $\Omega$	15 pF	HP 54600/01/02/03B	56.00 ea.
HP 10073A	500 MHz	1.5 m	10:1	10 M $\Omega$	12 pF	HP 54610B	153.00 ea.
HP 10430A	500 MHz	1 m	10:1	1 M $\Omega$	6.5 pF	HP 54500-series	179.00 ea.
HP 10437A	1 GHz	2 m	1:1	50 $\Omega$	NA	Scopes with 50 $\Omega$ inputs	128.00 ea.
HP 10438A	80 MHz	1 m	1:1	High Z	40 pF	Scopes with high-Z inputs	102.00 ea.
HP 10441A	500 MHz	2 m	10:1	1 M $\Omega$	9 pF	HP 54500-series	179.00 ea.
HP 10442A	1 GHz	2 m	10:1	500 $\Omega$	1.2 pF	Scopes with 50 $\Omega$ inputs	138.00 ea.
HP 10444A	500 MHz	1.6 m	10:1	1 M $\Omega$	9 pF	HP 54610B	179.00 ea.
HP 1137A	1 MHz	1.5 m	1000:1	500 M $\Omega$	3 pF	Scopes with 1 M $\Omega$ inputs	209.00 ea.

## The right accessories to be more productive.

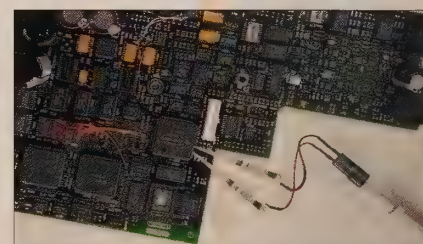


## HP Accessories

Product	Description	Price
HP 10072A	SMT kit for HP 10070-series probes; includes 10 SMT lead grabbers	\$66.00 ea.
HP 10450A	SMT kit for HP 10400-series probes; includes 10 SMT lead grabbers	82.00 ea.
HP 5081-7705	BNC adapter for HP 10070-series probes	28.00 ea.
HP 10100C	50 $\Omega$ Feedthrough termination BNC	56.00 ea.
HP 11094B	75 $\Omega$ Feedthrough termination BNC	37.00 ea.
HP 10110B	Dual banana to BNC (m) adapter	27.00 ea.
HP 1251-2277	Dual banana to BNC (f) adapter	15.50 ea.
HP 1183A	Testmobile scope cart for HP 54600-series scopes	495.00 ea.

### Tired of hauling around your scope?

Make your job easier and safer with the HP 1183A Testmobile, an economical cart custom-fitted for the HP 54600-series scopes.



The SMT kits include 10 SMT lead grabbers for fine-pitch circuitry.

Boost your measurement productivity with the right accessories.

# 1-800-452-4844



## HP logic analyzers

# Troubleshooting and design tools for a world gone digital.

### Can you face the future with just your scope?

It wasn't too many years ago that digital systems were the exception, not the rule. When you did run into digital circuits, you could conquer most of them with your trusty old scope.

Today, when even toasters have gone digital, it's a different story. Increasingly complex digital systems are everywhere, and your scope is having a hard time keeping up. Scopes are designed to provide a lot of detailed information about a small number of signals — just the opposite of what most digital measurements require.

### The right tools for the digital world.

In more and more situations, the right answer is to team your scope up with a logic analyzer. True logic analysis can make troubleshooting faster and more successful. You'll have the channels you need (from 16 to 136 or more), and you'll have the sequential and pattern triggering to isolate key events easily.

### Logic analysis isn't what it used to be.

We realize logic analyzers don't have a great reputation for cost-effectiveness or ease of use. Sure, if you designed processor-based systems all day long, it made sense to invest the time and money in a logic analyzer. If you needed a tool for occasional troubleshooting, however, a good scope was the sensible solution for logic analysis. Having only a few channels and limited triggering was a compromise, but at least your scope was easy to use.

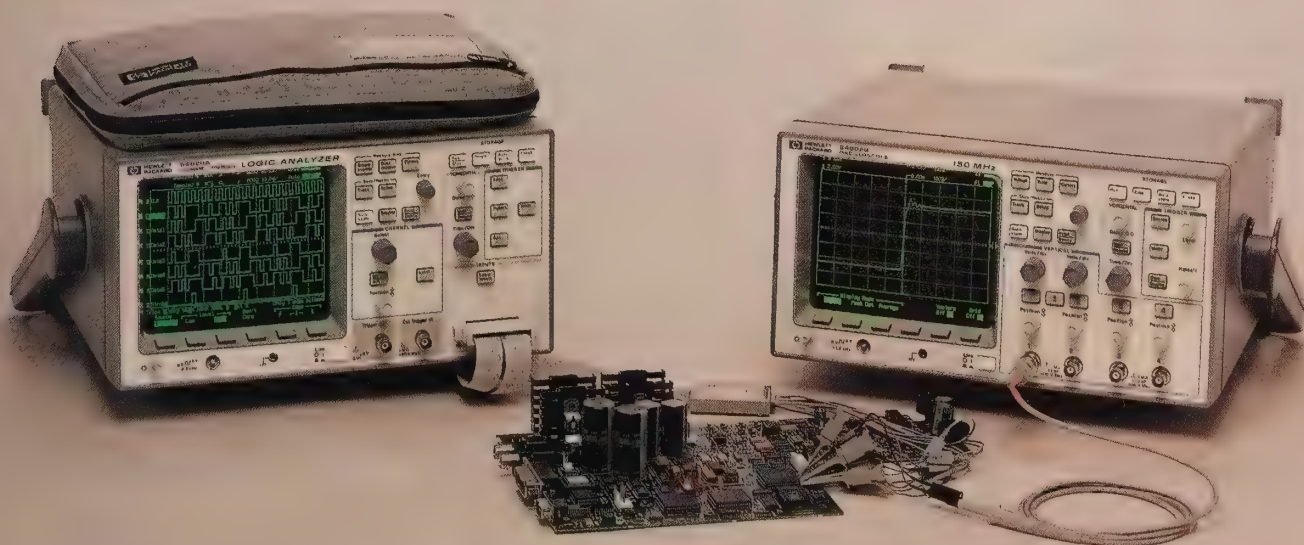
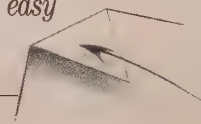
### Time to stop compromising, don't you think?

Now you can enjoy the benefits of logic analysis without all the learning and relearning. For quick troubleshooting on a wide variety of circuits and systems, the HP 54620A logic analyzer offers 500 MSa/s timing analysis on 16 channels, with the triggering you need to catch elusive events. And it's as easy to use as your scope — in fact, it's built on a scope platform, so you'll feel right at home right away.

For design and advanced troubleshooting of embedded microprocessor systems, the HP 1664A logic analyzer delivers both timing and state analysis. In other words, you not only see when things happen, you see what happens, too. You no longer have to guess what the hardware and software are up to. And the low price means you no longer have to do without this kind of power, either.

---

*See the HP 54620A on page 12  
and the HP 1664A on page 14  
— and see how easy  
logic analysis  
can be today.*



*Scopes give you lots of detailed information about a few signals; logic analyzers give you quick status reports on a dozen or more signals at once. Successfully troubleshooting many of today's digital systems requires both approaches.*



# Looks like a scope, feels like a scope. Must be HP's newest logic analyzer.

**For all those times you use a scope as a logic analyzer.**

When you were growing up, didn't somebody always lecture you about using the right tool for the job? So why are you using a scope for those jobs where a logic analyzer is the right tool? Like piecemealing your way through an eight-line logic problem when you have only four channels. Or tracking down a glitch that's hiding in a timing sequence far too complex for your scope's triggering abilities.

We know why, because you've been telling us loud and clear. You'd use logic analyzers if they were less expensive, easier to learn, easier to set up, and easier to operate. In other words, if they were more like scopes.

**Imagine: 16 channels of logic analysis, powerful triggering, and operation like a scope.**

Think how easy it would be to troubleshoot complicated digital and mixed-

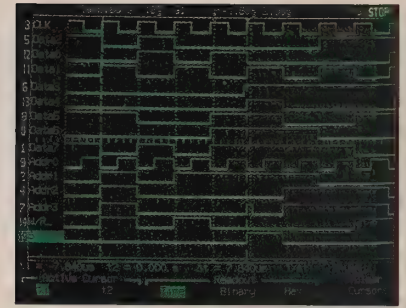
**It's a whole  
new way to  
look at logic.**

**1-800-  
452-4844**

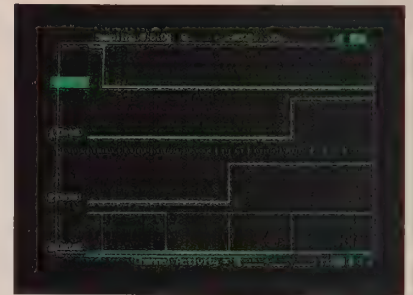
signal circuits if you had 16 channels of powerful logic analysis and the ability to trigger on edges, patterns, duration times and sequences.

The 500 Msa/s sampling rate gives you the power to catch the nastiest glitches. And you'll view the results on a sharp, high-speed display with an update rate of up to 15 screens per second, regardless of the number of active channels.

Add automatic measurements of frequency, period, duty cycle, width, delay and hold



*You've never done this on a logic analyzer — all active signals on the display, scaled for easy viewing, all with just one press of the Autoscale button.*



*Catch unstable and transient events, just like you would on your scope.*

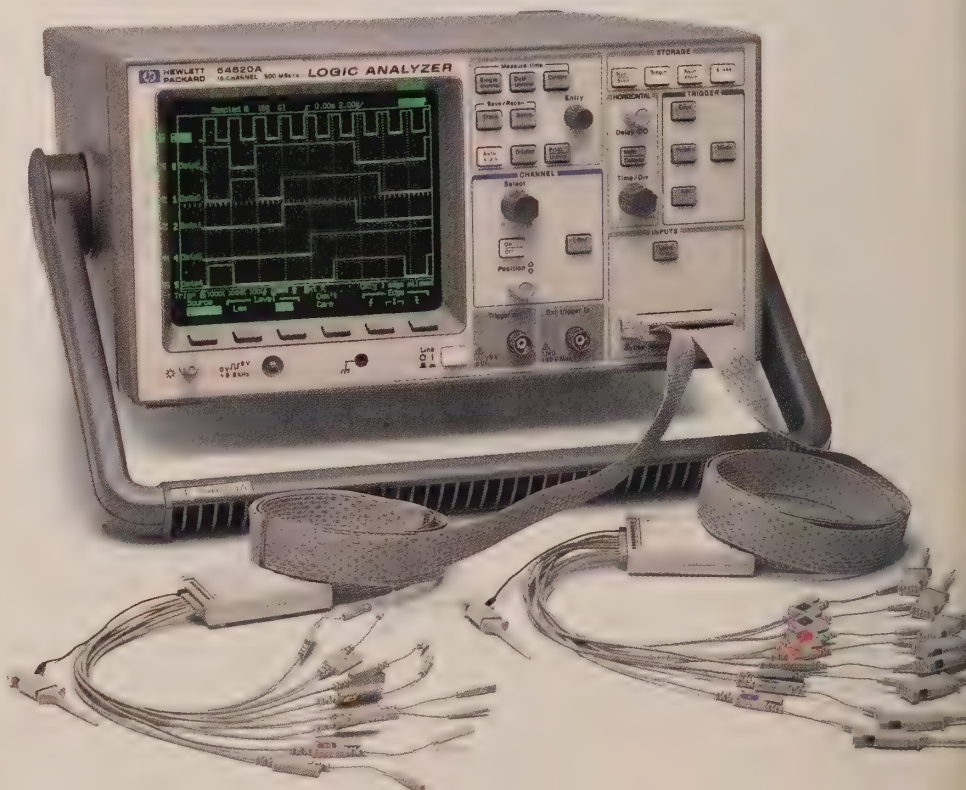
time, and you'll be ready to troubleshoot with speed and confidence.

For the ultimate in signal investigation, team the HP 54620A with your scope, using the logic analyzer's trigger-out function to trigger your scope.



*Get the familiar feel of a scope, with the triggering and channel count you need for complex digital troubleshooting.*

**\$2,995**





## HP 54620A Logic Analyzer

<b>Timing channels</b> Input R & C Maximum input	16 numbered 0–15 (all simultaneous) Approximately 100 k $\Omega$ and 8 pF $\pm 40$ V	Minimum input Threshold range	500 mVp-p about threshold $\pm 6.0$ V
<b>Timebase range</b> (main and delayed)	1 s/div to 5 ns/div		
<b>Timebase accuracy</b>	0.01% of reading		
<b>Timebase cursor accuracy</b> Single channel Dual channel	$\pm$ (sample period + 0.01% of reading + 0.2% of screen width) $\pm$ (sample period + 0.01% of reading + ch-ch skew + 0.2% of screen width)		
<b>Maximum sample rate</b>	500 MSa/s		
<b>Record length</b>	2 k for sample period $\leq 8$ ns (sweep speeds of 1 $\mu$ s/div to 1 s/div)		
<b>Glitch detect</b>	Automatically activated when sampling period is slowed to be $> 4$ ns (1 $\mu$ s/div and slower). Minimum detectable glitch: 3.5 ns		
<b>Triggering sources</b>	All channels and external		
<b>Auto/normal operation</b> Autotrig Normal	Free-running display if trigger not found Analyzer will wait indefinitely for trigger		
<b>Modes</b>	Edge, pattern, advanced (2 pattern and edge terms). Advanced operators: And, Or, Then, Entered, Exited, Duration ( $< >$ ) time, Occurs N times		
<b>Setup functions</b>	Autoscale, 16 saved setups, 2 trace memories, channel labeler (with 75 preset and user-defined labels)		
<b>Interface</b>	Compatible with HP 54650A, HP 54651A, and HP 54652B interface modules, and HP 34810A BenchLink/Scope software		
<b>Net weight</b>	6.8 kg (15 lbs)		
<b>Size</b>	172.7 mm H x 322.6 mm W x 317.5 mm D (6.8 x 12.7 x 12.5 in)		
<b>Warranty</b>	3 years		
<b>Ordering information</b>			
HP 54620A 16-channel logic analyzer	\$2,995.00 ea.	Opt. 104 5041-9409 Carrying case	\$214.00 ea.
Opt. 101 Accessory pouch and front panel cover	51.00 ea.	Opt. 106 HP 34810A BenchLink/Scope software	295.00 ea.
Opt. 103 54654A Operator's training kit	204.00 ea.	Opt. 1CM 5062-7345 Rack mount kit	260.00 ea.

### If you know how to run a scope, you know how to run this logic analyzer.

A logic analyzer that's as easy to use as a scope? We understand your skepticism. Traditional logic analyzers can be hard to set up and hard to operate, but you can run a scope in your sleep.

So, when we designed the HP 54620A, the objectives were clear: it had to drive like a scope, it had to be easy to connect to your circuits, and it had to be so easy to operate that you could sit down and be productive, even if you hadn't used it in weeks. Just like your scope.

### Now, brace yourself for this setup and operating procedure:

1. Connect the input channels.
2. Press Autoscale.
3. Look at the display.

Sounds just like driving a scope, doesn't it? (A scope with a great autoscale feature, that is!) The HP 54620A's autoscale identifies all active channels, displays the signals in correct order, and adjusts the timebase so you get a good look at every channel.

## Admit it, you're skeptical.

When the design team first came to us with prototypes, we were skeptical, too.

Then we tried it. This logic analyzer is so much like a scope that it's actually fun to use!

How did they do it? The high-throughput architecture and custom display processor of our HP 54600-series scopes provide the fast display updates and instant front panel response. And we use HP's unique "logic analyzer on a chip" — a 1.2 million transistor powerhouse — to handle the data acquisition.

Imagine what this can do for your troubleshooting. And then give us a call at HP DIRECT. We'll be happy to tell you exactly how it can be done.



How's this possible? It's easy. Let us show you how.

# 1-800-452-4844





Only \$4,600

Pick the mode of control that's fastest for you: front-panel, mouse, or PC-style keyboard.

## HP logic analyzers

# Don't let digital design problems destroy your schedule — or your budget.

### Start with the right tools to solve problems in a hurry.

Whether you need to troubleshoot hardware, verify bus operation, or debug software, the HP 1664A logic analyzer offers comprehensive state and timing analysis and the advanced triggering you need for complex digital systems.

### A streamlined design for fast answers.

Design problems are hard enough — don't choose a logic analyzer that makes things even worse. From the sensibly organized menus to the graphical trigger display that helps you set up any trigger sequence, the HP 1664A gets you to the solution sooner.

Having both state and timing analysis lets you see problems from more than one angle as you investigate signal timing, data flow or code execution. The chart mode converts streams of data into visual information, and the compare mode

### Cut your digital design time.

1-800-  
452-4844

makes it easy to check prototypes against a verified master board. And the built-in disk drive lets you transfer data or graphics files to a PC for documentation or further analysis.

### The performance to stay ahead of your latest designs.

Choose conventional timing mode for resolution down to

2 ns or transitional timing mode to analyze bursts of data as far as 34.3 seconds apart and up to 9.7 hours long. Transitional timing offers 8 ns resolution at 125 MHz on all channels or 4 ns on half channels, and the glitch timing mode detects intermittent signals as brief as 3.5 ns.

### Problems can't hide from this full-featured trigger.

When problems are buried under layers of logic, you need triggering tools to dig down and root them out. The HP 1664A can trigger on timeout violations in real-time

analyzer Listing IEEE 488									
Markers Pattern Find X-pattern -1 from Trigger Specify Patterns									
ADDR	Hex	ATN	Nonnumeric	HEX	EOI	SPD	REN	IPC	Absolute
-6	DFAE	P	50						-13.20
-5	DFA4	(ESC)	1B						-2.242
-4	DFA0	A	20						-2.095
-3	DFA4	C	20						-1.905
-2	DFA0	0	30						-1.674
-1	DFA0	9	33						-1.375
0	DFA0	space	20						0
1	DFA0	space	20						155.6
2	DFA0	space	20						745.0
3	DFA0	space	20						1.330
4	DFA0	5	40						1.910
5	DFA0	5	53						2.500
6	DFA0	2	20						3.095
7	DFA0	space	20						3.680
8	DFA0	0	40						4.267
9	DFA0	1	40						4.855

Tracing software execution and untangling bus communication are just two uses of the powerful state analysis tool.

applications and trace intricate algorithms. Twelve sequence levels for state triggering and ten levels of timing triggering make it possible to store or trigger on complex event series.



## HP 1664A Logic Analyzer

<b>State and timing channels</b>		34
<b>Memory depth/channel</b>		4 K per channel, 8 K in half-channel mode
<b>Timing analysis</b>		
Conventional mode	250 MHz all channels 500 MHz half channels	
Transitional mode	125 MHz all channels 250 MHz half channels	
Glitch mode	125 MHz half channels	
Sample period accuracy	±0.01% of sample period	
Channel-to-channel skew	2 ns typical, 3 ns maximum	
Minimum detectable glitch	3.5 ns	
<b>State analysis</b>		
Maximum speed <sup>1</sup>	50 MHz	
State clocks/qualifiers	2	
Setup/hold time <sup>2</sup>	0/3.5 ns through 3.5/0 ns, adjustable in 500 ps increments	
Minimum state clock pulse width	3.5 ns	
Time tag resolution <sup>3</sup>	8 ns or 0.1% (whichever is greater)	
Max. time count between states	34.4 s	
Max. state tag count <sup>3</sup>	4.29 x 10 <sup>9</sup> states	
<b>Triggering</b>		
Timing sequence levels	10	
State sequence levels	12	
Pattern recognizers	10	
Range recognizers	2, each 32 bits wide	
Edge/Glitch recognizers	2 (timing mode only)	
Max. occurrence counter value	1,048,575	
Timers	2	
Timer value range	400 ns to 500 s	
<b>Probes</b>		
Input resistance	100 kΩ, ±2%	
Input capacitance	~ 8 pF	
Minimum voltage swing	500 mVp-p	
Threshold range	±6.0 V, adjustable in 50 mV increments	
<b>Input/Output</b>		
I/O Ports	Centronics, RS-232 (optional), HP-IB (optional) and HIL for mouse and keyboard (optional)	
External arming	Input and output BNC connections with TTL signal levels	
Programmability	Fully programmable via optional RS-232 or HP-IB interface	
Mass storage	High-density, DOS/LIF format, 1.44 MB flexible disk drive	
File types	TIFF, PCX and PostScript screen image files, ASCII data files and binary-encoded data/configuration files	
<b>Physical factors</b>		
Dimensions	218 mm H x 440 mm W x 367 mm D (8.6 x 17.3 x 14.5 in)	
Weight	~ 11.8 kg (26 lbs)	
<b>Warranty</b>		1 year
<b>Ordering information</b>		
HP 1664A 34-channel logic analyzer	\$4,600.00 ea.	Opt. UK9 Front panel cover \$40.00 ea.
Opt. 020 RS-232 and HP-IB interfaces (includes both interfaces)	395.00 ea.	Opt. 1CM Rack mount kit 305.00 ea.
Opt. 0B5 Service manual	55.00 ea.	HP E2427A HIL Keyboard kit 195.00 ea.
Opt. 0B3 Quick Start Training Kit	95.00 ea.	HP 1180B Testmobile 290.00 ea.
		HP 35183A Work surface for HP 1180B 50.00 ea.

<sup>1</sup>Maximum state analysis speed does not change when time tags or state tags are used.

<sup>2</sup>Minimum setup/hold window is specified for single-edge, single-clock acquisition. Single-clock, multi-edge setup/hold window is 4.0 ns. Multiclock, multi-edge setup/hold window is 4.5 ns.

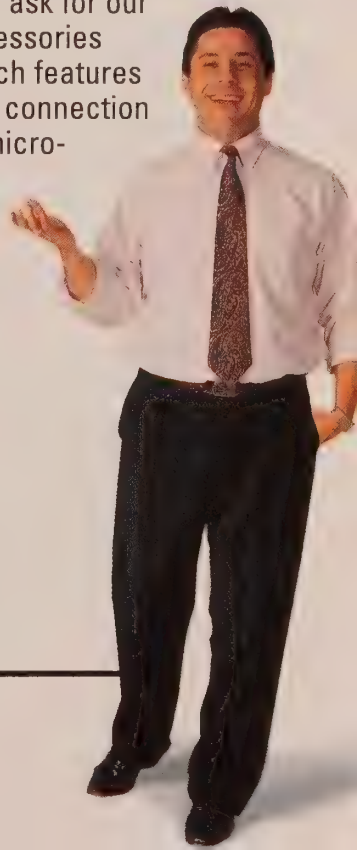
<sup>3</sup>Use of time tags or state tags will halve the memory depth.

## A solution for every digital design.

With all the customers we talk to, we know how diverse the field of digital design really is. The good news is that HP has a solution for virtually every digital application, from industrial automation to general-purpose computing.

The HP 1664A you see here is just one of the products in the HP 1660-series. Other analyzers in the family offer up to 136 channels, simultaneous state and timing analysis, and 100 MHz state analysis speed, giving you the power to handle the newest 32-bit designs. Some even provide built-in oscilloscopes to give both digital and analog views of suspect signals.

The engineers here at HP DIRECT are ready to answer your logic analysis questions — and be sure to ask for our free logic accessories brochure, which features more than 200 connection solutions for micro-processors and data buses.



We'll make sure you get the right  
digital tools.

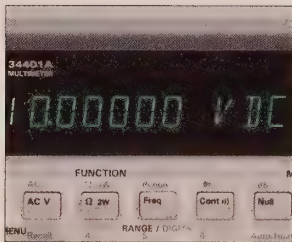
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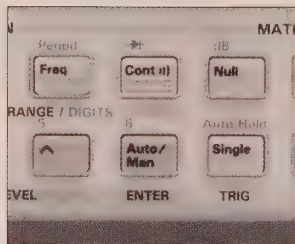
6½ digit  
accuracy  
at a 5½  
digit price.



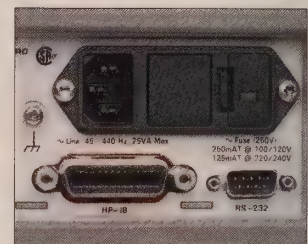
Only \$995



6½ digits means  
you'll catch  
details that other  
DMMs can't.



All the measure-  
ments you expect,  
plus features that  
make checkout on  
the bench easy.



Both HP-IB and  
RS-232 interfaces  
are standard.

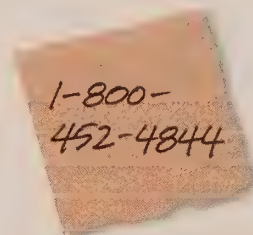
If you can find another DMM this  
accurate, it won't be this affordable.

Getting accuracy in a digital multimeter  
(DMM) used to mean spending big.  
Not anymore. For what you'd  
expect to pay for a 5½ digit  
DMM, you can now get the  
top-quality 6½ digit  
HP 34401A.

If people depend on you,  
depend on your HP 34401A.

With 6½ digits, you'll catch  
details that hide from lesser  
DMMs. And rest easy,  
knowing that the last  
measurement of the day will  
be as accurate as the first:  
24-hour accuracy is 0.0015% for  
dc volts and 0.06% for ac.

The highest-  
value meter in its  
class. Call:



Not just more features —  
more productivity.

Packing a DMM with features is fairly  
easy, but making those features work for

you is another story. The  
HP 34401A boosts your  
productivity by combining  
time-saving features with an  
easy-access user interface.  
One or two button presses  
give you a wide array of  
functions, from dc volts to  
frequency to dB and dBm.  
Advanced tests include limit  
checks that can drive a TTL  
output, min/max/avg read-  
outs, and dc voltage ratios.

Plus, the HP 34401A offers up to 1,000  
readings per second and 50 range changes  
every second. You'll save time putting the  
HP 34401A into a system, too. Standard  
Commands for Programmable

Instruments (SCPI), HP 3478A, and  
Fluke 8840/8842A command languages  
are built in, so you won't have to rewrite  
your existing test software.

For a giant productivity leap, check out  
HP 34812A BenchLink/Meter. This low-  
cost software package gives you graphing,  
basic statistics and data storage — with  
no programming.

**Chances are, you'll retire before it does.**

Unlike the short warranties on other  
DMMs, we back the HP 34401A for a full  
three years. (The secret behind our  
confidence: a mean-time-between-failure  
rating of 150,000 hours!)

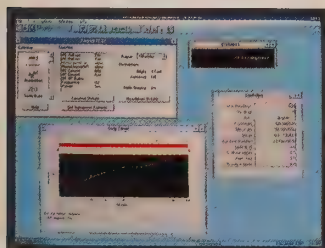


## HP 34401A Multimeter

Range	Resolution: 6½ digits (or freq. for ac volts)	Accuracy: 1 year ±(% of reading + % of range)	
<b>dc voltage</b>			
100 mV	100 nV	0.0050 + 0.0035	Input resistance
1 V	1 µV	0.0040 + 0.0007	10 MΩ or >10 GΩ
10 V	10 µV	0.0035 + 0.0005	10 MΩ or >10 GΩ
100 V	100 µV	0.0045 + 0.0006	10 MΩ
1000 V	1 mV	0.0045 + 0.0010	10 MΩ
<b>True rms ac voltage</b>			
100 mV	3 Hz–5 Hz	1.00 + 0.04	
	5 Hz–10 Hz	0.35 + 0.04	
	10 Hz–20 kHz	0.06 + 0.04	
	20 kHz–50 kHz	0.12 + 0.04	
	50 kHz–100 kHz	0.60 + 0.08	
	100 kHz–300 kHz	4.00 + 0.50	
for 1 V–750 V ranges	3 Hz–5 Hz	1.00 + 0.03	
	5 Hz–10 Hz	0.35 + 0.03	
	10 Hz–20 kHz	0.06 + 0.03	
	20 kHz–50 kHz	0.12 + 0.05	
	50 kHz–100 kHz	0.60 + 0.08	
	100 kHz–300 kHz	4.00 + 0.50	
<b>Resistance</b>			
100 Ω	100 µΩ	0.010 + 0.004	Current Source
1 kΩ	1 mΩ	0.010 + 0.001	1 mA
10 kΩ	10 mΩ	0.010 + 0.001	1 mA
100 kΩ	100 mΩ	0.010 + 0.001	100 µA
1 MΩ	1 Ω	0.010 + 0.001	10 µA
10 MΩ	10 Ω	0.040 + 0.001	5 µA
100 MΩ	100 Ω	0.800 + 0.010	500 nA
<b>dc current</b>			
	10 mA to 3 A ranges		
<b>ac current</b>			
	1 A to 3 A ranges		
<b>Frequency and period</b>			
	3 Hz (0.333 sec) to 300 kHz (3.33 µsec)		
<b>Continuity</b>			
	1000 Ω range, threshold variable from 1 Ω to 1 kΩ		
<b>Diode test</b>			
	1 V range, 1 mA test current		
<b>Math functions</b>			
	Null, min/max/avg, dBm, dB, limit test		
<b>Other features</b>			
	Automatic reading hold, 512 readings storage, dcV-dcV ratio		
<b>Maximum input</b>			
	dc and ac voltage	1000 Vdc, 750 rms ac	
	dc and ac current	3 A, from <250 V source, double fused	
<b>Shock and vibration</b>			
	meets MIL-T-28800D, Type III, Class 5		
<b>Power</b>			
	100/120/220/240 V, 45–65 Hz, 360–440 Hz		
<b>Net weight</b>			
	3 kg (6.5 lbs)		
<b>Size</b>			
	88.5 mm H x 212.6 mm W x 348.3 mm D (4 x 8.5 x 14 in)		
<b>Warranty</b>			
	3 years		
<b>Ordering information</b>			
HP 34401A Multimeter	\$995.00 ea.	HP 34130A Deluxe test lead set	\$35.00 ea.
Opt. 908 Rack mount kit	52.00 ea.	HP 34161A Accessory pouch	38.00 ea.
Opt. 910 Extra manual set	36.00 ea.	HP 34812A BenchLink/Meter	150.00 ea.
Opt. W50 Additional 2-year warranty	45.00 ea.		

See page 43 for RS-232 and HP-IB cable needs.

Get the most from your meter! See pages 20–21 for probes and other accessories.



*For a giant productivity leap, check out HP 34812A BenchLink/Meter on page 41. This low-cost software package gives you graphing, basic statistics and data storage — with no programming.*

## The engineering that makes it possible.

HP's full line of multimeters lets us leverage our engineering efforts across multiple products. The HP 34401A DMM is a great example. The designers started with the analog-to-digital converter they'd created for the 8½ digit HP 3458A DMM and scaled these techniques for the 6½ digit HP 34401A. Compared to the ADC in the HP 3478A DMM (the HP 34401A's predecessor), the result is a fivefold increase in accuracy and a tenfold increase in linearity — from an ADC that costs 60% less.

The HP 34401A's speed comes from three microprocessors: one for the data bus, one for measurement and timing, and one for display and control. Plus, our in-house experts in large-scale integration created three all-new ICs that consume less board space, boost performance, and at the same time significantly lowered our manufacturing costs.



Specs? Performance issues? Call HP DIRECT.

**1-800-452-4844**



# Putting benchtop features in the palm of your hand.

\$290

These compact multimeters will perform as well as your bench meter, without emptying your pockets.

The HP 970-series offers the basics and a whole lot more. Check out the high resolution temperature function, the auto diode feature that automatically reverses polarity, and the min/max feature that alerts you when a minimum or maximum is recorded.

Rely on basic dc accuracy up to 0.05%, frequency response to 100 kHz, and true rms with ac + dc for higher accuracy on nonsinusoidal waveforms. Dig deep with resolution as tight as 10  $\mu$ V.

Measure with confidence, too. The innovative safety shutter prevents accidental connection to the current terminals, and all models feature high-energy fuses and overload alarms.



The protective boot keeps your handheld safe so you can focus on your work.



▲ The HP 973A gives you more ways to test and troubleshoot.

The  $3\frac{1}{2}$  digit display (with 0.1% basic dc accuracy), 20 kHz frequency range, true rms, and ac + dc let you measure with confidence. Plus dBm and relative dB with dynamic range of 57 dB (2 mV to 400 mV) or 74 dB (0.2 V to 1000 V), with 0.1 dB resolution.

A convenient dual display makes it possible to view two digital readings simultaneously.

\$245

Measure low-level signals with the HP 972A.

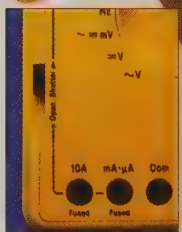
When you're chasing small signals, you'll appreciate 40 mV ranges for dc/ac voltage and the assurance of 20 kHz frequency response. And forget about using a dedicated capacitance tester: the HP 972A handheld multimeter can measure from 10 nF to 1000  $\mu$ F.



\$195

When things tend to get bumped and broken, there's no better handheld than the HP 971A.

Go ahead, toss the HP 971A in your tool box. Rubber seals protect it from the spills and thrills you face on the job.



HP's innovative safety shutter prevents inadvertent connection with current terminals.

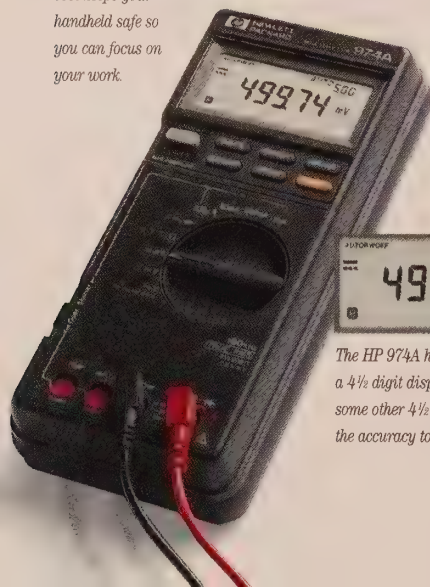
\$370

◀ When extra precision is required, so is the HP 974A.

The HP 974A's  $4\frac{1}{2}$  digit meter is as precise as you'll find, with a 49,999 count full scale.

Tough measurements? How about 100 kHz frequency response, true rms, ac + dc, and basic dc accuracy of 0.05% for all ranges.

The HP 974A has the resolution of a  $4\frac{1}{2}$  digit display and, unlike some other  $4\frac{1}{2}$  digit handhelds, the accuracy to back it up.





# HP E2373A, HP 971A, HP 972A, HP 973A and HP 974A Handheld Multimeters

Model	HP E2373A	HP 971A	HP 972A	HP 973A	HP 974A
Display count	3,200	4,000	4,000	4,000	49,999
Basic accuracy					
dc voltage	0.7%	0.3%	0.2%	0.1%	0.05%
ac voltage	1.2%	1%	0.5%	0.7%	0.5%
Ohms	0.7%	0.5%	0.2%	0.2%	0.06%
Capacitance	—	—	1.2%	1.2%	—
Frequency response (ac volts)	500 Hz	1 kHz	20 kHz	20 kHz	100 kHz
Resolution/maximum					
dc voltage	100 $\mu$ V/1000 V	100 $\mu$ V/1000 V	10 $\mu$ V/1000 V	10 $\mu$ V/1000 V	10 $\mu$ V/1000 V
ac voltage	1 mV/750 V	100 $\mu$ V/1000 V	10 $\mu$ V/1000 V	10 $\mu$ V/1000 V	10 $\mu$ V/750 V
Ohms	0.1 $\Omega$ /30 M $\Omega$	0.1 $\Omega$ /40 M $\Omega$	0.1 $\Omega$ /40 M $\Omega$	0.1 $\Omega$ /40 M $\Omega$	0.01 $\Omega$ /50 M $\Omega$
Current	10 $\mu$ A/10 A	100 nA/10 A	100 nA/10 A	100 nA/10 A	10 nA/10 A
Elapsed time	—	1 min/1999 min	1 min/1999 min	1 min/1999 min	1 sec/9999 min
Frequency	—	1 Hz/100 kHz	0.01 Hz/200 kHz	0.01 Hz/200 kHz	0.01 Hz/200 kHz
Safety shutter		•	•	•	•
High-energy fuse, overload alert		•	•	•	•
Relative, percent		•	•	•	•
Min/max, average		•	•	•	•
Hold, auto hold		•	•	•	•
Bargraph	•	•	•	•	•
Thermistor temp.		•	•	•	•
Thermocouple temp.				•	
Dual digital display			•	•	
True rms ac response				•	•
ac + dc				•	•
dBm/dB				•	•
Warranty	3 years				
Ordering information					
HP E2373A Handheld multimeter	\$99.00 ea.		HP E2304A Soft carrying case		\$19.00 ea.
HP 971A Handheld multimeter	195.00 ea.		HP E2306A Deluxe test lead kit		35.00 ea.
HP 972A Handheld multimeter	245.00 ea.		HP E2307A Thermocouple bead probe type-K		
HP 973A Handheld multimeter	290.00 ea.		(HP 973A only)		25.00 ea.
HP 974A Handheld multimeter	370.00 ea.		HP E2308A Thermistor temperature probe		35.00 ea.
Opt. W50 Additional 2-year warranty	45.00 ea.				

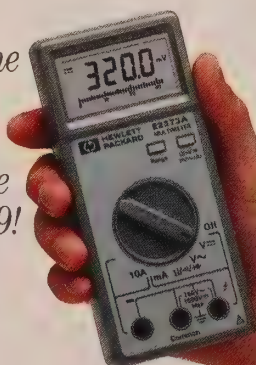
Note: All HP 970-series multimeters have Vdc, Vac, ac/dc current, ohms, continuity, diode test, auto diode test, temperature °F and °C, frequency, auto/manual ranging, autopower off, secondary display for range and min/max, and 3-year warranty. Standard accessories include a pair of test leads, operating and calibration manual, Certificate of Calibration, spare fuse, and rubber boot. Two 1.5 V AA alkaline batteries installed.

The HP E2373A has Vdc, Vac, ac/dc current, ohms, continuity, diode test, auto/manual ranging, and a 3-year warranty. Standard accessories include a pair of test leads, manual, spare fuse, and installed batteries.

*From spare leads to thermocouples — turn the page for must-have accessories.*

*Compare these DMMs with all the popular models on the market. And don't let a tight budget stop you; call HP DIRECT and ask about the HP E2373A — only \$99!*

**1-800-452-4844**



**Within budget,  
without compromise.**



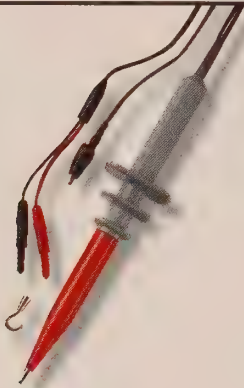
# Get the most from your handheld or HP 34401A multimeter with these accessories.



Test leads are 1.2 m (48 in) long with straight shrouded banana plug inputs. Kit comes in Velcro®-sealed pouch.

**HP 34130A Deluxe Test Lead Set.....\$35.00 ea.**

## Accessories for both your HP handheld multimeter and HP 34401A.



Bandwidth (-3dB) 150 Hz 2% to 5% accuracy. For use with any DMM with 10 MΩ input resistance. 1000:1 division ratio.

**HP 34300A 40 kV ac/dc  
High-Voltage Probe.....\$90.00 ea.**



100 kHz to 700 MHz bandwidth. 0.25 Vrms to 50 Vrms range. +1 dB accuracy to 500 MHz, +2 dB to 700 MHz. 1 Vdc output for 1 Vrms input. For use with any DMM with 10 MΩ input resistance.

**HP 34301A 700 MHz RF Detector Probe...\$80.00 ea.**



+10 A ac or dc; or +100 A ac or dc probe. 1 kHz bandwidth. +1.0 Vdc output at 10 A or 100 A. +2% accuracy. 19 mm aperture.

**HP 34302A Clamp-on ac/dc  
Current Probe .....\$250.00 ea.**

## HP handheld multimeter accessories.

*Note: Type-K thermocouple probes are for use with HP 973A multimeter only.*



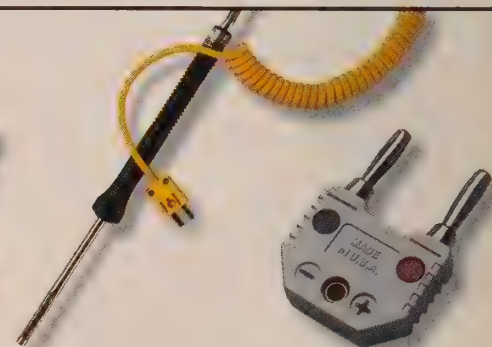
Padded case with dual zipper and snap-on belt strap.

**HP E2304A Handheld Multimeter  
Carrying Case .....\$19.00 ea.**



Test leads are 1.2 m (48 in) long with right-angle shrouded banana plug inputs. Kit comes in Velcro®-sealed pouch.

**HP E2306A Deluxe Test Lead Kit.....\$35.00 ea.**  
**HP E2305A Spare Test Leads (2 pairs) ....\$15.00 ea.**  
(not shown)



Basic accuracy +2.2 °C (4 °F). Must use with HP E2303A adapter.

**HP E2301A Surface Type-K  
Thermocouple Probe .....\$120.00 ea.**

Used to connect type-K thermocouple probes to HP 970-series handheld DMMs.

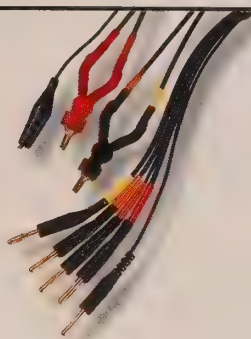
**HP E2303A SMP-to-Dual  
Banana Plug Adapter.....\$12.00 ea.**





Cordura® pouch fits on top of the HP 34401A DMM, the HP 53131/32/81A counter and the HP 33120A function/arb generator.

**HP 34161A Accessory Pouch .....\$38.00 ea.**



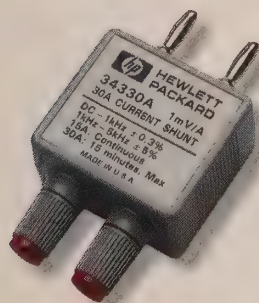
Works with any DMM with 4-wire  $\Omega$  function. Gold-plated flat tweezers ensure precise contact to the components being measured. Maximum input voltage is 42 V.

**HP 11059A Kelvin Probe Set .....\$135.00 ea.**



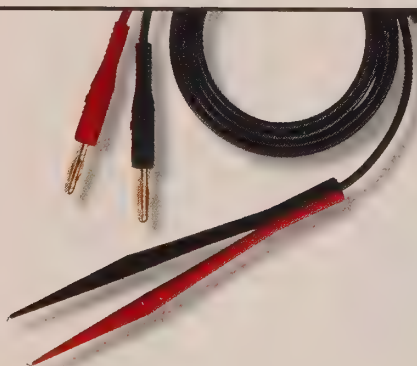
Two silver-plated flat tweezer clips to construct your own Kelvin probe set for 4-wire  $\Omega$  measurements.

**HP 11062A Kelvin Clip Set.....\$26.00 ea.**



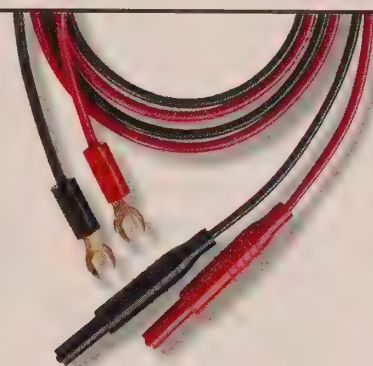
1 mV/A output; 15 A continuous; 30 A for 15 minutes maximum.

**HP 34330A 30A Current Shunt .....\$55.00 ea.**



Tweezer designed for easy access to surface mount components. Maximum voltage: 42 Vp.

**HP 11060A Surface Mount Device Probe.....\$24.00 ea.**



Low thermal jumpers to minimize error in low-voltage measurements.

**HP 11053A Lug-to-Lug Jumpers .....\$29.00 ea.**  
**HP 11174A Lug-to-Banana Jumpers .....\$29.00 ea.**  
**HP 11058A Banana-to-Banana Jumpers.....\$29.00 ea.**



Basic accuracy  $\pm 2.2^{\circ}\text{C}$  ( $4^{\circ}\text{F}$ ).

**HP E2307A Type-K Thermocouple Bead Temperature Probe.....\$25.00 ea.**



5 k $\Omega$  at  $25^{\circ}\text{C}$ . Basic accuracy  $\pm 0.2^{\circ}\text{C}$  ( $0.4^{\circ}\text{F}$ ).

**HP E2308A Thermistor Temperature Probe .....\$35.00 ea.\***



5 k $\Omega$  at  $25^{\circ}\text{C}$ . Basic accuracy  $\pm 0.1^{\circ}\text{C}$  ( $0.2^{\circ}\text{F}$ ).

**HP 40653B Surface Sensor Assembly with Thermistor .....\$62.00 ea.\***

\*For use only with the HP 970-series handheld multimeters.

Call a sales engineer to talk about any meter needs you have.

**1-800-452-4844**



# 225 MHz counters: first you save money, then you save time.

Universal and RF counters that give a lot more than they take.

The HP 53100-series provides exceptionally fast measurements, unflinching accuracy, and rugged, lightweight construction that fits as nicely within your budget as it does on your benchtop. Choose the model with the features you need, with frequencies up to 1.5 or 3 GHz as options.

**No more waiting between measurements.**

The HP 53100-series uses real-time digital signal processing to analyze data while simultaneously taking new readings. So while other counters are stuck in processing "dead time," these HP counters have already moved on to the next measurement.

Not only faster, they're also easier to use.

With automated limit tests and one-button access to the features you need most, you'll get the job done in a hurry. And once you've set up for a test, a touch of the Recall button will instantly restore that setup when you need it again.

It's easy to get more from your test data, too. You can perform statistics on all measurements and simultaneously measure and track average, min/max and standard deviation.

**Automation is fast and easy, too.**

With the HP-IB interface, standard command language (SCPI), and

continuous data transfer rates of over 200 measurements per second, you'll get the job done in a hurry.

**Fast. Accurate.  
Easy. For even  
MORE on  
these counters,  
call HP DIRECT.**

1-800-  
452-4844

Only \$1,725  
HP 53131A



A quick glance at the analog mode display tells you whether a measurement is within pass/fail limits.

An advanced method for measuring frequency and time intervals gathers more data with each measurement, so you get higher-resolution answers in a fraction of the time.

**Speed, function and economy: pick the model that's best for you.**

The HP 53131A offers 10 digit/sec resolution at up to 225 MHz on two channels (with an optional 3 GHz third channel), with a variety of measurements — from frequency, time interval, and pulse parameters to phase angle and totalize.

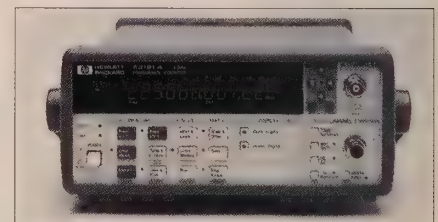
Need more performance? HP 53132A offers the same measurement set as the HP 53131A, with up to 12 digit/sec resolution — the highest measurement throughput and resolution available.

Need a counter optimized for RF applications? The value-priced HP 53181A RF counter provides 10 digits/second up to 225 MHz, with the option of a 1.5 or 3 GHz second channel.



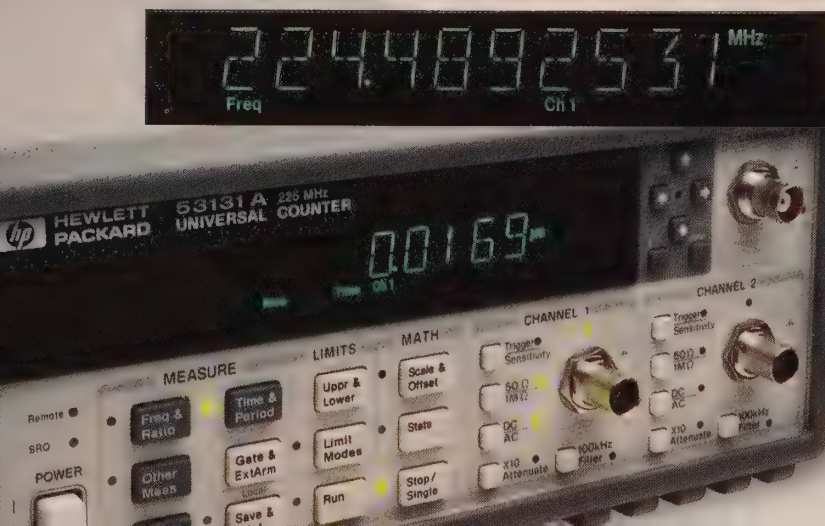
HP 53132A \$2,495

- Same features and functions as the HP 53131A
- Increased resolution — up to 12 digits/sec
- Even faster measurement rates for most signals



HP 53181A \$1,500

- Same speed, accuracy, and resolution as HP 53131A at a budget price
- Same statistics, math and automated limit testing
- Frequency, period and peak voltage measurements
- Optional second channel provides 1.5 or 3 GHz measurements





# HP 53131A, HP 53132A 225 MHz Universal Counters and HP 53181A 225 MHz RF Counter

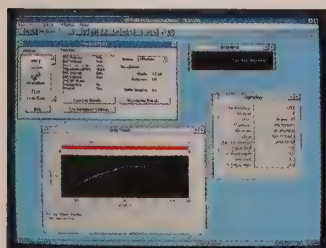
	HP 53131A	HP 53132A	HP 53181A
<b>Measurements</b>	Frequency, frequency ratio, time interval, period, rise/fall time, positive/negative pulse width, duty cycle, phase (CH 1 to CH 2), totalize, peak voltage, time interval average, time interval delay		Frequency, frequency ratio (with optional CH 2), period, peak voltage
<b>Analysis</b>	Automatic limit testing, math (scale and offset), statistics (minimum, maximum, mean, standard deviation). Statistics available on all measurements or only measurements that fall within limits.		
<b>Measurement characteristics</b>			
Frequency range	CH 1 & 2: dc-225 MHz	CH 1 & 2: dc-225 MHz	CH 1: dc-225 MHz
Frequency resolution	10 digits/sec	12 digits/sec	10 digits/sec
Measurement speed	Up to 200 meas/s	Up to 200 meas/s	Up to 200 meas/s
Time interval resolution (LSD)	500 ps	150 ps	NA
<b>Input conditioning</b>	(Independently selectable on CH 1 & 2)	(Independently selectable on CH 1 & 2)	(Selectable on CH 1)
Impedance, coupling	1 M $\Omega$ or 50 $\Omega$ , ac or dc	1 M $\Omega$ or 50 $\Omega$ , ac or dc	1 M $\Omega$ or 50 $\Omega$ , ac or dc
Low pass filter	100 kHz, switchable	100 kHz, switchable	100 kHz, switchable
Attenuation	x1 or x10	x1 or x10	x1 or x10
<b>External timebase reference input</b>	1, 5, 10 MHz	10 MHz	1, 5, 10 MHz
<b>Trigger</b>	CH 1 & 2 Trigger on rising/falling edge; set level by percent of signal level or absolute voltage; set sensitivity to LOW, MED, or HIGH	CH 1 & 2	CH 1
<b>Gating and arming</b>	Auto, manual (set gate time or number of digits of resolution); external; delay		
<b>Interfaces</b>	Standard HP-IB (IEEE 488.1 and 488.2) with SCPI-compatible language; talk only RS-232		
<b>Power</b>	90-132 Vac; 45-66 Hz or 360-440 Hz/198-264 Vac; 45-66 Hz		
<b>Net weight</b>	3 kg (6.5 lbs)		
<b>Size</b>	212.6 mm W x 88.5 mm H x 348.3 mm D (8.5 x 4.0 x 14.0 in)		
<b>Warranty</b>	3 years		

## Ordering information

HP 53131A 10 digit per second 225 MHz Universal counter	\$1,725.00 ea.	Opt. 001 Medium-stability timebase	\$600.00 ea.
HP 53132A 12 digit per second 225 MHz Universal counter	2,495.00 ea.	Opt. 002 External dc power	250.00 ea.
HP 53181A 10 digit per second 225 MHz RF counter	1,500.00 ea.	Opt. 010 High-stability timebase	900.00 ea.
(counters include power cord, operating & programming manuals)		Opt. 012 Ultra-stability timebase (HP 53132A & HP 53181A only)	1,500.00 ea.
HP 34812A BenchLink/Meter	150.00 ea.	Opt. 015 1.5 GHz Channel 2 (HP 53181A only)	500.00 ea.
Opt. W50 Additional 2-year warranty* starts at	45.00	Opt. 030 3 GHz Channel 3 (3 GHz Channel 2 on HP 53181A)	800.00 ea.

Complete your test system with quality HP cables; see page 43.

\*Call HP DIRECT for more information on Opt. W50 prices.



Add value to your counter data!  
HP 34812A BenchLink/Meter adds  
graphics, more statistics, and  
archiving. See page 41.

## Delivering innovative technology at an everyday price.

It would be just about impossible to create counters with this much performance at prices this low if you started from scratch. Fortunately, our engineers didn't have to. By leveraging innovative technology developed for HP's modulation domain analyzers

(MDAs), they gave these low-cost counters top-of-line performance.

For instance, it's the MDA's signal processing algorithm (programmed into the HP 53100-series gate array) that lets us offer up to 12 digit/second resolution in a value-priced counter.



For the counter that best meets your measurement needs,  
call HP DIRECT.

**1-800-452-4844**



# Custom waveform generation in a function generator at this price? Sure!

\$1,725

**What can you expect from a function generator this affordable? Everything.**

You know the feeling. You'd like to have more confidence in your test signals, but you can't afford one of those top-of-the-line function generators. Meet the HP 33120A function/arbitrary waveform generator, with the rock-solid stability of digital synthesis at a price even your accounting department will feel good about.

And not only do you get better performance, you get arbitrary waveforms available for the first time in this price range. Just imagine the ways you could use complex custom waveforms, from simulating heartbeats and vibrations to testing circuits in ways never before possible at this price. With 12-bit resolution, 40 MSa/s, and storage for up to four 16 k-deep waveforms, you have nearly unlimited flexibility.

**Spectral purity this good means no hidden surprises.**

Low cost means messy harmonics and other extra baggage, right? Well, check out the harmonic distortion specs and

clear signals you get with the HP 33120A. Then try to find the same performance anywhere else at this price.

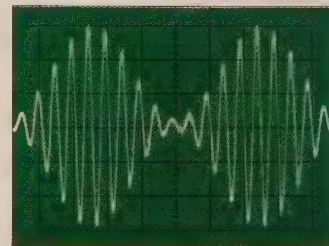
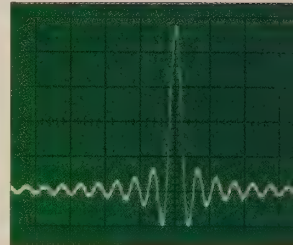
**Everybody promises functionality. But we made it effortless.**

In fact, you can access any of ten major functions with a single key press. Sweep and modulation expand your test options without expanding your equipment list. Plus you get full programmability using Standard Commands for Programmable Instruments (SCPI) with standard HP-IB and RS-232.

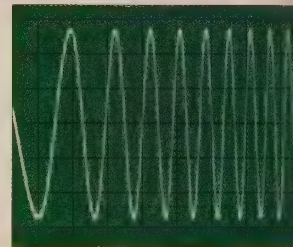
Create any  
waveform  
you need. Call  
HP DIRECT.

1-800-  
452-4844

*A built-in 16 k-deep arbitrary waveform generator handles your custom waveform needs.*

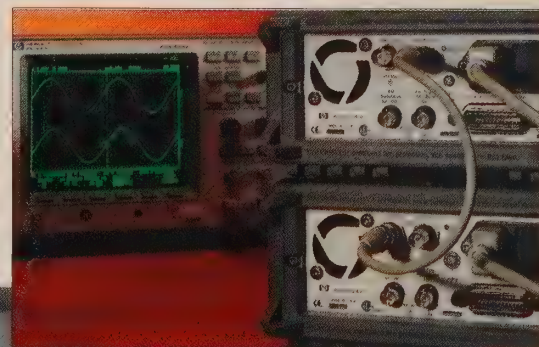


*Internal AM, FM, FSK, and burst modulation eliminate the need for a second modulation source.*



*Both linear and log sweeps are built in, making filter and amplifier testing quick and easy.*

*The Option 001 phase lock/TCXO timebase increases the HP 33120A's frequency stability and opens up new system options. Generate precise phase-offset signals, phase lock two HP 33120As or sync your generator to a 10 MHz frequency standard. You can even tie an entire ATE system to a master clock.*





## HP 33120A Function/Arbitrary Waveform Generator

### Waveforms

Standard Sine, square, triangle, ramp, noise, sin(x)/x exponential rise and fall, cardiac, dc volts

### Arbitrary

Waveform length 8 to 16,000 points  
Nonvolatile memory Four waveforms (each from 8 to 16,000 points)  
Amplitude resolution 12 bits  
Sample rate 40 MSa/s

### Frequency characteristics

Sine	100 $\mu$ Hz–15 MHz	White noise	10 MHz bandwidth
Square	100 $\mu$ Hz–15 MHz	Resolution	10 $\mu$ Hz or 10 digits
Triangle	100 $\mu$ Hz–100 kHz	Accuracy	10 ppm in 90 days
Ramp	100 $\mu$ Hz–100 kHz		(18 °C–28 °C)

### Sinewave

Harmonic distortion  
dc to 20 kHz –70 dBc  
20 kHz to 100 kHz –60 dBc  
100 kHz to 1 MHz –45 dBc  
1 MHz to 15 MHz –35 dBc  
THD dc to 20 kHz <0.04%

### Output characteristics

Amplitude  
(into 50  $\Omega$ ) 50 mVp-p–10 Vp-p  
(into open circuit) 100 mVp-p–20 Vp-p  
Accuracy (at 1 kHz)  $\pm$ 1% of specified output  
Flatness (sinewave relative to 1 kHz)  
<100 kHz  $\pm$ 1% (0.1 dB)  
100 kHz to 1 MHz  $\pm$ 1.5% (0.15 dB)  
1 MHz to 15 MHz  $\pm$ 2% (0.2 dB)

### Modulation

AM		FSK	
Carrier –3 dB Frequency	15 MHz (typical)	Internal Rate	10 mHz–50 kHz
		Deviation	10 mHz–15 MHz
Modulation	Any internal waveform including Arb	Source	Internal/external (1 MHz max.)
Frequency	10 mHz–20 kHz	Burst	
Depth	0%–120%	Carrier Frequency	5 MHz max.
Source	Internal/external	Count	1 to 50,000 cycles
FM		Start Phase	–360° to +360°
Modulation	Any internal waveform including Arb	Internal Rate	10 mHz–50 kHz $\pm$ 1%
Frequency	10 mHz–10 kHz	Gate Source	Internal/external gate
Deviation	10 mHz–15 MHz	Trigger Source	Single, external or internal rate
Source	Internal only		

### Option 001 Phase Lock/TCXO Timebase

Timebase accuracy  
Stability  $\pm$ 2 ppm 0 °C–50 °C  
Aging <1 ppm in first 30 days (continuous op)  
0.1 ppm/month (after first 30 days)

External reference/Input  
Lock range 10 MHz  $\pm$ 50 Hz

Internal reference/Output  
Frequency 10 MHz

Power 100 V/120 V/220 V/240 V

Net weight 4 kg (8.8 lbs)

Size 254.4 mm W x 103.6 mm H x 374 mm D  
(10.0 x 4.0 x 15.1 in)

Warranty 3 years

### Ordering information

HP 33120A Function/Arb generator	\$1,725.00 ea.	Opt. 1CM Rack mount kit	\$52.00 ea.
Opt. 001 Phase Lock/TCXO Timebase	395.00 ea.	Opt. W50 Additional 2-year warranty	45.00 ea.
Opt. 106 HP 34811A BenchLink/Arb software	295.00 ea.	Opt. 910 Extra manual set	36.00 ea.
(can also be ordered separately as HP 34811A)		HP 34161A Accessory pouch	38.00 ea.

See page 43 for RS-232 and HP-IB cable needs.

## Manufactured to reduce cost — not capability.

When our engineers design low-cost products, manufacturing time is one of their top concerns. After all, money we squeeze out of the production process is money that stays in your pocket.

For the HP 33120A, specialists from R&D, production, and quality assurance started with the goal of creating a no-compromises product that could be manufactured quickly and efficiently. They finished with a function generator that we can assemble in less than one-third the time its predecessor took. The new design cuts test time in half, too.

Create waveforms on a PC and download them to the HP 33120A with HP 34811A BenchLink/Arb software.  
(See pages 40–41.)



## Within budget, without compromise.

I've had a lot of experience with function generators. Give me a call.

# 1-800-452-4844



The faces behind the phones:

# The HP team dedicated to



HP DIRECT does more than deliver products; we help you create solutions.

Do any of these experiences sound familiar? You call a supplier to ask questions or place an order, but nobody has the answers you need. Or they've never even heard of your application. Or instead of listening to your problems, they seem more interested in getting you to buy something — fast. Or they don't feel your small order is worthy of first-class customer service.

The support and advice we can offer go beyond just the products. If you're not quite sure about the best way to meet a particular test or measurement challenge, tell us what you need to accomplish, and we'll help you find the right solution.

HP DIRECT is the complete package: top-quality basic instruments that fit your budget, technical experts who know how to solve measurement problems, the information you need to make decisions, and a support network that worries about all the details so you don't have to.

Get the information you need to make the right choice.

If you have questions about specs or features, give us a call. We're tapped into all the right information here at HP DIRECT, plus we have comparative information on major competitive products.

We also have an extensive library of technical data sheets and brochures if you want even more information before you make a decision. We can answer questions right over the phone, or fax or ship information if you prefer.

What do you need? A cable?  
Performance specs? Consultation with an engineer?  
HP DIRECT is the one information resource for all  
your basic instrument needs.

**1-800-452-4844**

For Twin-Plant customers in Mexico call (303) 754-4999.

*“Recently I had a caller who was absolutely drowning in specs. I was able to help weed through all the numbers and get to the three key specs that made his DMM decision simple.”*



# solving your problems.

When you have a tough decision to make, wouldn't you like to discuss it with an experienced engineer?

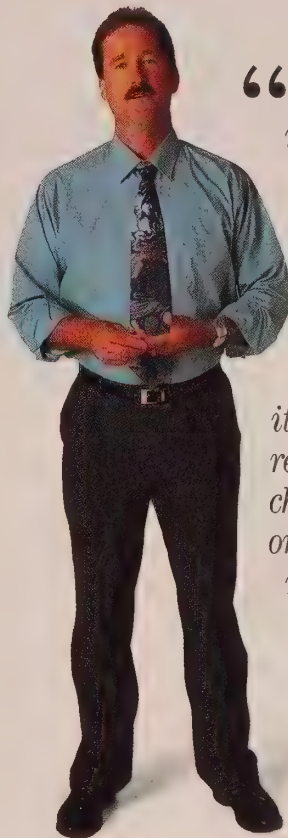
When you're making a major buying decision, we understand that the wrong choice can lead to frustration, disappointing results, or worse. That's why we staff HP DIRECT with experienced engineers who can help you make the right equipment choices. We know the applications as well as the products you can choose from, so we can take the risk out of an important equipment purchase.

If you're not quite sure about the best way to meet a particular test or measurement challenge, tell us what you need to accomplish. The support and advice we can offer go beyond just the products.

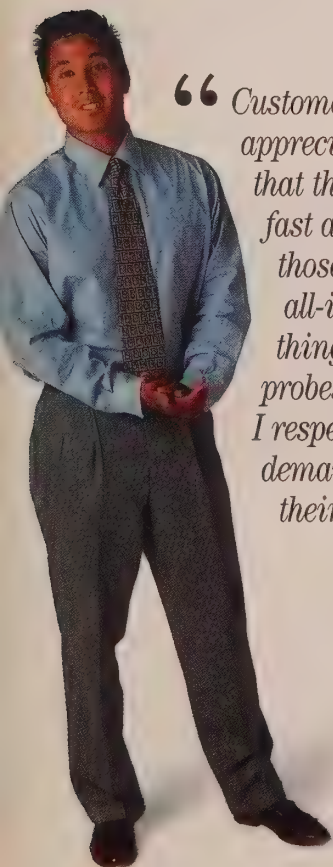
We've made it easy to order — or just to ask questions.

HP DIRECT is set up to make the whole process as easy as possible for you. We're open from 8 a.m. to 5 p.m. across all continental time zones, and you can choose a payment option that's most convenient for you. Use a major credit card or open an account in minutes (all we need is your billing address and a purchase order number).

*“ I think the most enjoyable part of my job is helping people solve technical problems. Customers love it when I can recommend cheaper, faster, or easier ways to make their measurements. ”*



*“ Customers appreciate the fact that they can get fast answers for those simple but all-important things, such as probes and cables. I respect the demands on their time. ”*



*“ As sales consultants, we're your first point of contact with HP DIRECT and we're happy to answer many of your questions, provide comparative specs, or send you technical literature. But when you need to speak with an experienced working engineer, we'll make sure you're put in contact with the right person. ”*





For discontinuous signals, the HP 8116A offers single cycles, gated sequences, and counted bursts for all waveforms. For haversine or triangle waveforms, use the 90° start-phase key. For sonar, ultrasound and PLL testing, take advantage of amplitude, frequency and pulse width modulation, as well as VCO capability. For digital IC testing, rely on clean pulses. For extensive customization, you can use external signals to modulate the output and trigger the generator at the same time.

The HP 8116A function generator will even help you clean up noisy signals. Feed them into the external input and use the external width mode to make those problem pulses as good as new.

For setting the output, choose between peak levels or amplitude to match the way parameters are defined in your application. And naturally, the HP 8116A is fully programmable via HP-IB for bench or system automation.

Functions	Sine, triangle, ramp, square, pulse, haversine, havertriangle, dc
Operating modes	Normal, trigger, gate, ext. width, optional burst and sweep
Frequency	
Range	1.00 mHz–50 MHz Opt. 001 bursts up to 40 MHz
Accuracy	<100 kHz: $\pm 3\%$ $\pm 0.3$ MHz
Jitter	$\geq 100$ kHz: $\pm 5\%$ <0.1% + 100 ps
	} applies to pulse mode and functions with 50% duty cycle
Pulse width	
Range	10.0 ns–999 ms
Accuracy	$\pm 5\%$ $\pm 2$ ns
Amplitude	
Range	10.0 mV–16.0 Vp-p (into 50 $\Omega$ ; voltages double into high impedance)
Accuracy	$\pm 5\%$ (applies to pulse and square mode at all frequencies, triangles and sines at 1 kHz)
Total harmonic distortion	10 Hz–50 kHz: <1% (–40 dB)
Pulse/square wave transitions	<7 ns
Control input	AM, FM, PWM and VCO
Option 001	
Counted burst mode:	1 to 1999 cycles, internal or external trigger
Sweep mode:	Logarithmic upsweep, 1 mHz to 50 MHz in one range
Memory	Battery backup RAM retains current operating state
Power	100/120/220/240 Vac, 48–440 Hz
Net weight	5.9 kg (13 lbs)
Size	89 mm H x 212 mm W x 450 mm D (3.5 x 8.36 x 17.7 in)
Warranty	1 year

HP 8116A 50 MHz		Rack mount kit	
Pulse/Function generator	\$4,900 ea.	5062-3972 Single instrument	\$60.00 ea.
Opt. 001 Burst & sweep	600.00 ea.	Two instruments side-by-side	
Opt. W50 Additional 4-year warranty	190.00 ea.	5062-3974 Rack flange	35.00 ea.
		5061-9694 Lock link kit	45.00 ea.
		1251-0405 Miniature connector	7.00 ea.

HP 8116A PULSE/FUNCTION GENERATOR 50 MHz  
HEWLETT • PACKARD

MODE CTRL  
NORM LSWP FM  
TRIG E SWP AM  
ADS GATE L BUR PWM  
SRQ E WID E BUR VCO

LCL

50p MAN 1 CYCLE

EXT INPUT ±20V

LEVEL -10V +10V

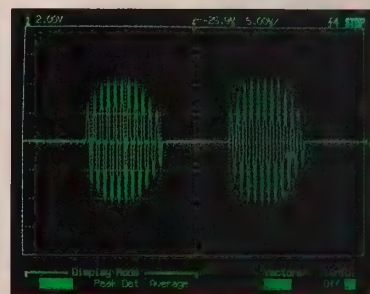
CTRL INPUT ±20V

TRIG OUTPUT

OUTPUT

AUTO VERNIER RANGE

AUTO LIMIT COMPL DISABLE



Only \$4,900

HP DIRECT. The key to making your best function generator decision.

**1-800-452-4844**

# These multiple output power supplies fit your budget as well as your benchtop.

Only \$500

**Built like system supplies, but priced for the bench.**

The ordinary way to create a low-cost power supply is to offer fewer features and lower performance. Trouble is, you don't want an ordinary supply. Maybe it's time to put an HP on your bench. Only HP offers a supply packed with valuable features at the same high quality you expect from our system supplies.

With multiple outputs, there's no need to fill your benchtop — or empty your budget — with more than one supply. (The outputs on the HP E3620A are completely independent and isolated.)

**You won't have to compensate for unwanted signals.**

Find some peace and quiet. The peace of mind that comes from tight 0.01% load and line regulation. The quiet that comes from ripple and noise levels at  $<350 \mu\text{Vrms}/1.5 \text{ mVp-p}$  with minimal line current injection.

**Protect your circuitry and your investment with the two-output HP E3620A and the three-output HP E3630A.**

Smooth turn-on and turn-off transitions keep power spikes out of your circuits. The HP E3620A and HP E3630A give you stable performance from start to finish.

These low-cost supplies undergo the same rigorous tests as our system supplies. The result? A failure rate of less than 0.5% per year backed by a three-year warranty. Find *that* in another low-cost supply!

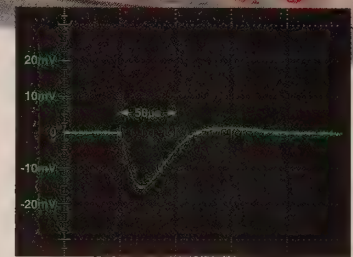
**Make output settings quickly with an easy-to-use front panel.**

Save time while you're saving money. Because separate meters display voltage and current, you can set levels precisely and monitor each output at a glance. In other words, you can focus on your circuits and test procedures instead of fiddling with your power supply.

For clean power you've never expected from a benchtop power supply.

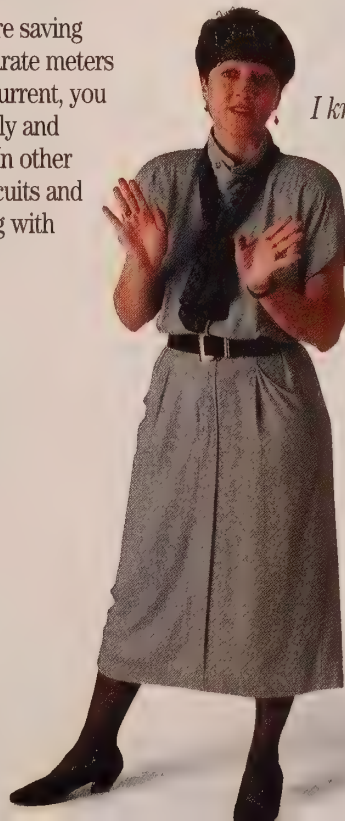
1-800-452-4844

See next page for HP E3620A and HP E3630A specs and more of HP's low-cost, high-value power supplies!

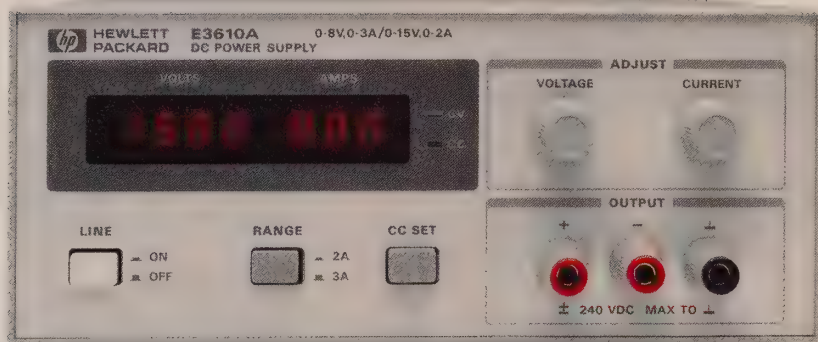


*Fast transient response means stable and predictable voltages for your circuitry when the load varies.*

*I know you want to choose the right power supply, and you don't want to wait forever. Give me a call, and we can go over specs and features.*







Starting at  
Only \$300

### Put the performance of a system power supply on your benchtop.

Forget the usual worries about low-cost supplies. The HP E3600-series gives you clean power with dependable regulation and fast transient response. And they turn on and off without overshoot, so you get precise output from start to finish.

The pleasant surprises don't stop there. You can choose constant voltage (CV) mode or constant current (CC) mode, changing automatically based on load. In CV mode, it's easy to set safe current levels for every test.

### We spent a lot of time on our front panel so you won't have to.

Tired of fumbling with confusing dials and buttons? A pair of digital meters shows your output status at a glance, and the 10-turn pots are quick and accurate.

### Inferior supplies cause more than employee burnout.

Whose side is your power supply on, anyway? A poorly regulated supply that puts your circuits in danger is working against you, not for you. In the

HP E3610/11/12A, CV/CC mode lets you preset both current and voltage limits so you can be sure your circuits are getting the levels you think they are.

For even more peace of mind, check out the HP E3614/15/16/17A. Adjustable overvoltage protection — a feature you don't expect on low-cost supplies — makes it easy to keep your circuits out of

harm's way. One switch is all you need to set precise voltage and current limits.

Supplies that sense voltage levels at their outputs may not be as accurate as you need. The HP E3614/15/16/17A use remote sensing to measure voltage at the load instead. Count on unsurpassed

# The only thing we left out of these power supplies was the high price.

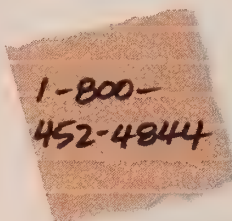
accuracy during your tests — the supply automatically compensates for voltage drops.

So stop worrying about circuit damage from poorly regulated supplies. In fact, you don't need to worry about your supply at all. With a failure rate under 0.5% per year and a three-year warranty, there's nothing left to worry about.

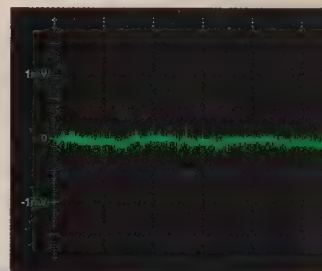
### Control multiple supplies from one master unit.

Need more current or voltage? The HP E3614/15/16/17A let you control multiple supplies with a single unit. Autoparallel shares current equally, and autoseries shares voltage equally or proportionally. And when you're tied in series, autotracking lets you change levels simultaneously or proportionately.

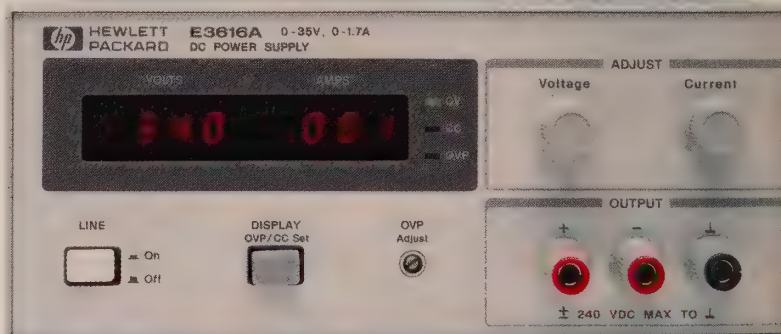
Get clean power with any supply you select.



Low noise means unwanted signals aren't injected into your circuitry.



Need a low-noise, high-output supply?  
The HP 6500-series  
is on page 32!



## HP E3600-series dc Power Supplies

	HP E3610A	HP E3611A	HP E3612A	HP E3614A	HP E3615A	HP E3616A	HP E3617A	HP E3620A	HP E3630A
Number of outputs	1	1	1	1	1	1	1	2	3
Output (max. voltage, current)	8 V, 3 A or 15 V, 2 A	20 V, 1.5 A or 35 V, 0.85 A	60 V, 0.5 A or 120 V, 0.25 A	8 V, 6 A	20 V, 3 A	35 V, 1.7 A	60 V, 1 A	25 V, 1 A 25 V, 1 A	+6 V, 2.5 A +20 V, 0.5 A -20 V, 0.5 A
Features	Dual range, 10-turn pots, Constant Voltage (CV), Constant Current (CC) modes			Adjustable overvoltage protection, voltage programming, remote sense, rear outputs, 10-turn pots, CV, CC modes; multiple supplies can be connected for tracking or higher power				Dual outputs, 10-turn pots, CV, CL	Tracking, CV, CL
Load and line regulation	0.01% + 2 mV								
Ripple and noise voltage	<200 $\mu$ Vrms, <2 mVp-p			<200 $\mu$ Vrms, <1 mVp-p			<350 $\mu$ Vrms, <1.5 mVp-p		
Common mode current	Not specified							<1 $\mu$ Arms	
Transient response time	<50 $\mu$ sec following change in output current from full load to half load for output to recover to within: 10 mV15 mV								
Meter accuracy	$\pm 0.5\% + 2$ counts at 25 °C $\pm 5$ °C								
Meter resolution	volts	10 mV	100 mV	10 mV	10 mV (0–20 V), 100 mV (>20 V)				10 mV
	current	10 mA	1 mA	10 mA				1 mA	10 mA
Isolation	240 Vdc								
Size	91 mm H x 213 mm W x 319 mm D (3.6 x 8.4 x 12.6 in)			91 mm H x 213 mm W x 400 mm D (3.6 x 8.4 x 15.8 in)					Same as HP E3610A
Warranty	3 years								
Price	\$300.00 ea.			\$500.00 ea.					
Options	Opt. 0E9 100 Vac $\pm 10\%$ , Opt. 0E3 230 Vac $\pm 10\%$ , Opt. W50 Additional 2-year warranty \$45.00 ea.								

## How do you build more accuracy AND less cost into a power supply?

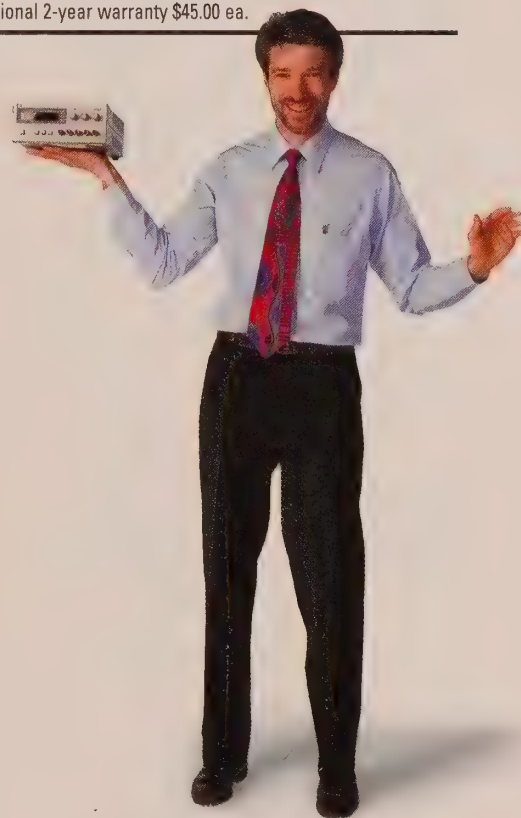
The secret is experience. Our power products engineers have years of experience designing everything from top-of-the-line system supplies to value-priced benchtop units. For the HP E3600-series, they used that experience to make sure these new supplies provide stable, dependable output signals.

Just as important, however, is our experience in manufacturing. Because our production specialists have built so many supplies over the years, they

know how to cut costs without cutting corners.

Improvements such as standardized parts for more efficient inventory management and redesigned cases with fewer screws that take less time to assemble. They seem like little things, but they add up to big savings.

So put some experience on your benchtop, with products that fit your budget without compromising performance.



Within budget,  
without compromise.

Call HP DIRECT to discuss the power supply that's right for you.

**1-800-452-4844**



# Demand less from a low-cost power supply.

(Less noise, that is.)

With low noise, fast transient response and tight regulation, the HP 6500-series offers the clean, stable output you need to work with confidence at voltages up to 120 V and currents up to 50 A.

## Stop wrestling with your supply.

Use the knobs, keypad, or up/down buttons for easy entry. Set up quickly with states saved in nonvolatile memory. Calibrate without pulling the supply from its rack or even removing the cover.

## But don't sacrifice protection.

The HP 6500-series keeps your circuitry safe with overvoltage and overcurrent protection. Thermal protection shuts off current flow if the temperature of critical components ever exceeds design limits. And they are backed with full three-year warranties.

Call HP DIRECT:  
From low-cost benchtop units to high-performance system supplies, we can help you find whatever you need.

1-800-  
452-4844

From \$1,785

Linear design and careful component layout in the HP 6500-series power supply produce low ripple noise.



### HP 6500-series Power Supplies

Model no.	Output		PARV (RMS/P-P)		Load regulation	
	Voltage	Current	Voltage	Current	Voltage	Current
HP 6541A	0-8 V	0-20 A	300 $\mu$ V/3 mV	10 mArms	1 mV	1 mA
HP 6542A	0-20 V	0-10 A	300 $\mu$ V/3 mV	5 mArms	2 mV	0.5 mA
HP 6543A	0-35 V	0-6 A	400 $\mu$ V/4 mV	3 mArms	3 mV	0.25 mA
HP 6544A	0-60 V	0-3.5 A	500 $\mu$ V/5 mV	1.5 mArms	4 mV	0.25 mA
HP 6545A	0-120 V	0-1.5 A	700 $\mu$ V/7 mV	1 mArms	5 mV	0.25 mA
HP 6551A	0-8 V	0-50 A	300 $\mu$ V/3 mV	25 mArms	1 mV	2 mA
HP 6552A	0-20 V	0-25 A	300 $\mu$ V/3 mV	10 mArms	2 mV	1 mA
HP 6553A	0-35 V	0-15 A	400 $\mu$ V/4 mV	5 mArms	3 mV	0.5 mA
HP 6554A	0-60 V	0-9 A	500 $\mu$ V/5 mV	3 mArms	4 mV	0.5 mA
HP 6555A	0-120 V	0-4 A	700 $\mu$ V/7 mV	2 mArms	5 mV	0.5 mA

### Net weight

HP 6541A-HP 6545A	14.2 kg (31.4 lbs)
HP 6551A-HP 6555A	25 kg (54 lbs)

### Size

HP 6541A-HP 6545A	88.1 mm H x 425.5 mm W x 439 mm D (3.56 x 16.75 x 17.3 in)
HP 6551A-HP 6555A	132.6 mm H x 425.5 mm W x 497.8 mm D (5.22 x 16.75 x 19.6 in)

### Warranty

3 years

### Ordering information

HP 6541A Power supply	\$1,885.00 ea.	HP 6551A Power supply	\$2,550.00 ea.
HP 6542A Power supply	1,785.00 ea.	HP 6552A Power supply	2,345.00 ea.
HP 6543A Power supply	1,785.00 ea.	HP 6553A Power supply	2,345.00 ea.
HP 6544A Power supply	1,785.00 ea.	HP 6554A Power supply	2,345.00 ea.
HP 6545A Power supply	1,835.00 ea.	HP 6555A Power supply	2,395.00 ea.
5062-3974 Rack mount kit for HP 6541A-HP 6545A	36.00 ea.	5062-3977 Rack mount kit for HP 6551A-HP 6555A	41.00 ea.
5062-3975 Rack mount kit with handles for HP 6541A-HP 6545A	82.00 ea.	5062-3983 Rack mount kit with handles for HP 6551A-HP 6555A	92.00 ea.



# FREE.

## The industry's widest range of power products.

*It's all here —  
comprehensive  
power products  
for both bench  
and system  
applications.*

### ***HP has solutions for all your power needs.***

**If you have a question about power, here's the answer.**

The 1995/96 HP Power Products Catalog (HP pub. #5963-3906EUS) is your most concise source for accurate and reliable information to help you with all your power supply needs. You can find all of HP's ac sources, dc power supplies, electronic loads and power test systems in one convenient and informative 64-page catalog. We've added more products and more information in a clear, easy-to-use format, making this catalog an invaluable reference source.

### **Get detailed specs on all HP power products.**

With complete product descriptions and dozens of spec tables and technical drawings, the HP Power Products Catalog has all the information you need to make the right choice in power products. From the HP 66000-series supplies for ATE systems to value-priced benchtop units, you'll find everything you need to know before making a decision.

### **Discover the complete range of HP power products.**

The HP Power Products Catalog contains detailed information on all HP power products, including:

#### **More than 30 single-output programmable supplies:**

- Wattage ratings from 100 W to 5000 W
- Voltages from 5 V to 500 V; current ratings from 5 A to 875 A

#### **A wide range of multiple-output programmable supplies:**

- Wattage ratings from 25 W to 80 W
- Voltages from 7 V to 50 V; current ratings from 15 mA to 10 A
- Two to four outputs

#### **A complete selection of dc power modules for the HP 66000 modular power system mainframe:**

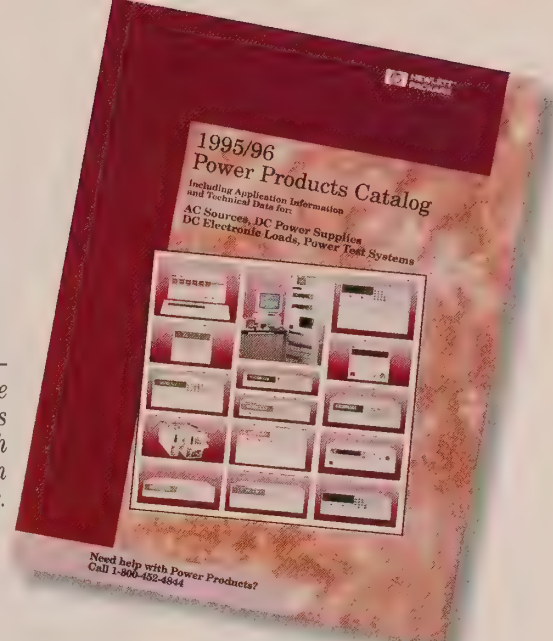
- Wattages up to 150 W
- Voltages from 8 V to 200 V; amp ratings from 0.75 A to 16 A
- Up to eight outputs in 7½ inches of rack space

#### **Electronic loads in both stand-alone and modular configurations:**

- Wattages from 150 W to 600 W
- Variable voltages from 3 V to 240 V
- Current ratings from 10 A to 120 A

#### **AC power source/analyzers with built-in harmonic analysis capability:**

- 750 to 3500 VA single phase
- 4500 VA 3 phase



The catalog also describes power test systems and specialized products such as the HP solar array simulator. You'll see that HP has the widest range of power products in the industry that are certified to UL, CSA, VDE and ISO-9000 (and most carry the CE mark).

### **Application information to help you get the most from your power supplies.**

The HP Power Products Catalog is more than just a catalog. It's an information-packed resource guide. The application section provides guidelines for making ac power and load connections, calculating system specifications, and using analog programming methods. You'll get advice on procedures such as making remote error-sensing connections and making load connections to two or more power supplies in the same system.

In addition, the comprehensive glossary defines all the terms and acronyms you need to select and use power products successfully.

Call for the 1995/96 HP Power Products Catalog. It's FREE.

# 1-800-452-4844



# Test transformers without testing your budget.



The HP 4263A is the first LCR meter that gives you accuracy and automation — without the high price.

## A simple way to make complex measurements.

Stop reconnecting to measure primary and mutual inductance, dc resistance, or turns-ratio. With switchable internal dc bias source and the optional transformer test fixture, you don't have to. Measure Z, D, G, B, Y, Q, X, and  $\Theta$  as easily as you measure L, C, and R.

The programmed frequencies of 100 Hz, 120 Hz, 1 kHz, 10 kHz, and 100 kHz, and signal levels of 50 mV, 100 mV, 250 mV, 500 mV, and 1 Vrms give you quick access to precise test signals.

The HP 4263A LCR meter remembers setups so you don't have to. The setup at power-down is autoloading at next power-up, and you can save 10 more in non-volatile memory.

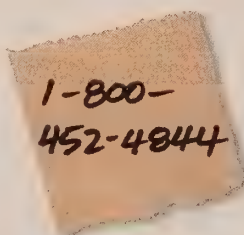
## You'll never doubt the results you get.

The HP 4263A LCR meter has a 100 m $\Omega$  range and low-noise design. The benefit is basic accuracy of 0.1% and 4 TP measurement and error correction for unmatched precision, especially on high-capacitance measurements. Fast contact check lets you know instantly whether your device is connected properly.

## If you're measured on productivity, get ready for major success.

Your measurements will go quickly with test speeds of 25 ms at 100/120 Hz, and a 5 ms contact check. And no delays from overloading, because the vector ratio detector recovers quickly from amp saturation.

The HP 4263A  
can really  
save you money.  
To learn how,  
call HP DIRECT.



## You've never dreamed building automated test systems could be this easy.

It's easy with the built-in comparator, HP-IB, photo-isolated handler interface, and flexible test features such as the trigger delay that overcomes chatter from switching or handling devices.

### HP 4263A LCR Meter

#### Frequency range

#### Test signal level

#### Impedance parameters

#### Transformer measurement functions (with Option 001)

#### dc bias

#### Measurement speed

#### Basic accuracy

#### Error correction

#### Save/recall

#### Cable length settings

#### Power

#### Net weight

#### Size

#### Warranty

#### Ordering information

HP 4263A LCR meter	\$4,850.00 ea
Opt. 001 Add N/M/DCR transformer test	675.00 ea
Opt. 908 Rack mount kit	61.00 ea
Opt. W30 Additional 2-year warranty	90.00 ea
Opt. W50 Additional 4-year warranty	180.00 ea
Test Fixtures and Accessories	
HP 16034E SMD Component test fixture	980.00 ea
HP 16047A Axial and radial test fixture	320.00 ea
HP 16047C High-frequency test fixture	370.00 ea
HP 16047D Direct attachment test fixture	270.00 ea
HP 16048A 0.94 meter/BNC test leads	370.00 ea

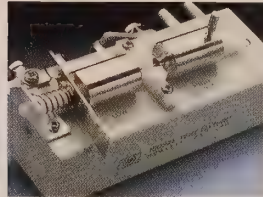
# HP 4263A LCR meter accessories make any job easy.



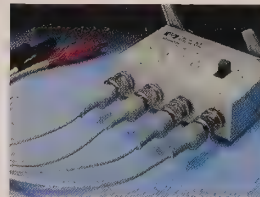
100 Hz, 120 Hz, 1 kHz, 10 kHz, 100 kHz  
50 mV, 100 mV, 250 mV, 500 mV, 1 Vrms  
Z, Y, R, X, G, B, C, L, D, Q,  $\Theta$   
N, M, DCR  
1.5, 2.0 Vdc  
25 ms, 65 ms, 500 ms  
0.1%  
Open, short, load (via HP-IB)  
10 settings  
0 m, 1 m, 2 m, 4 m  
90–132 Vac or 198–264 Vac  
47–66 Hz  
4.5 kg (9.9 lbs)  
320 mm W x 100 mm H x 300 mm D  
(12.6 x 3.9 x 11.8 in)  
1 year

HP 16048B 0.94 meter/SMC test leads	\$350.00 ea.
HP 16048D 1.89 meter/BNC test leads	475.00 ea.
HP 16048E 3.8 meter/BNC test leads	475.00 ea.
HP 16060A Transformer test fixture	580.00 ea.
HP 16064B LED Display/trigger box	350.00 ea.
HP 16065A 200 Vdc External voltage bias fixture	980.00 ea.
HP 16065C 40 Vdc External voltage bias adapter	485.00 ea.
HP 16089A Large Kelvin clip leads	525.00 ea.
HP 16089B Medium Kelvin clip leads	515.00 ea.
HP 16089C Kelvin IC clip leads	620.00 ea.
HP 16089D Alligator clip leads	440.00 ea.
HP 16334A SMD Tweezer test fixture	580.00 ea.

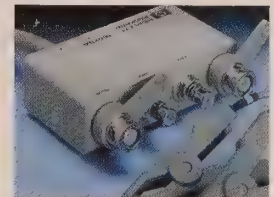
**HP 16034E**  
SMD Component  
Test Fixture .....\$980.



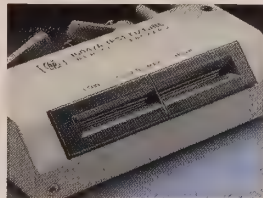
**HP 16060A**  
Transformer  
Test Fixture .....\$580.



**HP 16089A**  
Large Kelvin  
Clip Leads.....\$525.



**HP 16047A**  
Axial and Radial  
Test Fixture .....\$320.



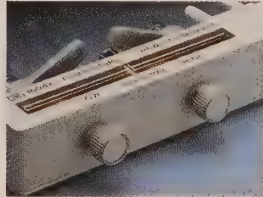
**HP 16064B**  
LED Display/  
Trigger Box .....\$350.



**HP 16089B**  
Medium Kelvin  
Clip Leads.....\$515.



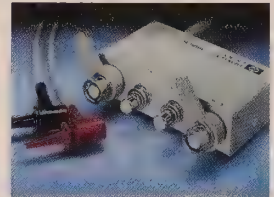
**HP 16047C**  
High-frequency  
Test Fixture .....\$370.



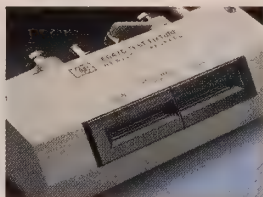
**HP 16065A**  
200 Vdc External Voltage  
Bias Fixture.....\$980.



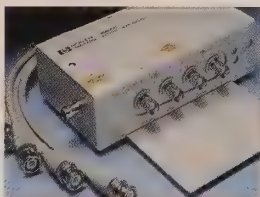
**HP 16089C**  
Kelvin IC  
Clip Leads.....\$620.



**HP 16047D**  
Direct Attachment  
Test Fixture .....\$270.



**HP 16065C**  
40 Vdc External Voltage  
Bias Adapter .....\$485.



**HP 16089D**  
Alligator  
Clip Leads.....\$440.



**HP 16334A**  
SMD Tweezer  
Test Fixture .....\$580.



Customize your LCR meter for your application.  
Call HP DIRECT.

**1-800-452-4844**



# Accurate power measurements made simple.

\$2,780

*Push-button operation makes configuration a snap.*

You asked for fast, easy power measurements that don't cut corners on quality. Here's your answer. The HP 437B delivers the accuracy you need — in a hurry.

**When we say accurate, we mean  $\pm 0.5\%$  accurate!**

The HP 437B achieves that accuracy ( $\pm 0.5\%$  linear,  $\pm 0.02$  dB log) with exceptional linearity in the meter itself and low SWR on the HP 8480-series power sensors.

**Get precise measurements in a flash.**

Why struggle and strain for measurements when the HP 437B gives them to you at the push of a well-placed button? Select the measurement function with just a single key press, then hit the data entry keys to finish the setup. That's it.

No need to bother with calibration factors; the preloaded cal table takes care of that. Simply enter the frequency of your test signal. And don't worry about zeroing out measurements, either. Automated digital zeroing eliminates zero carry-over and reduces zero drift.

**If it got any smarter, it would program itself.**

The HP 437B will feel right at home in your automated and semiautomated system. Save up to 10 setups in memory for easy changeovers. Program all controls with simple two-letter codes. Make an easy switch to system automation with built-in HP-IB and full interrupt capability.

**It'll seem like we built one just for you.**

Your measurements are unique? No problem: the HP 437B knows how to adapt. Display power in watts or dBm — and correct for loss or gain. Put autoranging to work or set the range manually for maximum flexibility.

**The HP 437B will stay on the job forever (approximately).**

With a mean-time-between-failure rate of 120,000 hours, the HP 437B will deliver accurate measurements year after year after year.



*Selectable resolution lets you control measurement speed and display resolution.*

## HP 437B Power Meter

Frequency range (sensor dependent)	100 kHz to 50 GHz		
Power range (sensor dependent)	-70 dBm to +44 dBm		
Accuracy	±0.02 dB		
HP-IB programmable	Standard		
Automatic sensor calibration	Yes		
Automatic range selection	Yes		
Number of inputs	1		
Rear X-Y recorder output	Yes		
Programmable digital filter	Yes		
Power	100, 120, 220, or 240 Vac 48-66 Hz		
Net weight	2.6 kg (5.9 lbs)		
Size	88 mm W x 213 mm H x 273 mm D (3.5 x 8.4 x 11 in)		
Warranty	1 year		
<b>Ordering information</b>			
HP 437B Power meter	\$2,780.00 ea.	Opt. W30 Additional 2-year warranty	\$65.00 ea.
Opt. 002 Parallel rear input	102.00 ea.	Opt. W50 Additional 4-year warranty	130.00 ea.

# Power meter accessories to get the job done right.

*The handy analog peak  
meter lets you see power  
peaks and nulls quickly.*

## Power Sensors for your HP 437B

### HP Power Sensors

Product No.	Frequency	Power	Connector	Price
HP 8481A	10 MHz–18 GHz	1 $\mu$ W–100 mW	N(m)	\$810.00 ea.
HP 8481B	10 MHz–18 GHz	1 mW–25 W	N(m)	1,925.00 ea.
HP 8481D	10 MHz–18 GHz	100 pW–10 $\mu$ W	N(m)	1,145.00 ea.
HP 8481H	10 MHz–18 GHz	100 $\mu$ W–3 W	N(m)	1,015.00 ea.
HP 8482A	100 kHz–4.2 GHz	1 $\mu$ W–100 mW	N(m)	810.00 ea.
HP 8482B	100 kHz–4.2 GHz	1 mW–25 W	N(m)	1,820.00 ea.
HP 8482H	100 kHz–4.2 GHz	100 $\mu$ W–3 W	N(m)	985.00 ea.
HP 8483A*	100 kHz–2 GHz	1 $\mu$ W–100 mW	N(m)	810.00 ea.
HP 8485A	50 MHz–26.5 GHz	1 $\mu$ W–100 mW	APC–3.5 (m)	1,250.00 ea.
HP 8485D	50 MHz–26.5 GHz	100 pW–10 $\mu$ W	APC–3.5 (m)	1,615.00 ea.
HP 8487A	50 MHz–50 GHz	1 $\mu$ W–100 mW	APC–2.4 (m)	2,595.00 ea.
HP 8487D	50 MHz–50 GHz	100 pW–10 $\mu$ W	APC–2.4 (m)	3,230.00 ea.

\*HP 8483A has 75  $\Omega$  impedance. A 75  $\Omega$  to 50  $\Omega$  Type N adapter is included for calibration.

## Power Sensor Cables

### HP Cables

Product No.	Description	Length	Price
HP 11730A	Power meter cable	1.5 m (5 ft)	\$102.00 ea.
HP 11730B	Power meter cable	3 m (10 ft)	122.00 ea.
HP 11730C	Power meter cable	6 m (20 ft)	179.00 ea.
HP 11730D	Power meter cable	15 m (50 ft)	255.00 ea.
HP 11730E	Power meter cable	30 m (100 ft)	355.00 ea.
HP 11730F	Power meter cable	60 m (200 ft)	560.00 ea.

For more on the HP 437B or any of these accessories,  
just call HP DIRECT.

**1-800-452-4844**



# Synthesized signals with the push of a button.

**Finally! The 250 kHz to 1000 MHz performance you demand, at the price you want.**

What's your latest test challenge? Cordless phones? Pagers? RF components? No matter what you make, two things are certain: your customers are demanding more, and your competitors are giving you less room to maneuver. You need test gear that keeps up with your expanding demands and your shrinking budget.

Introducing the HP 8647A signal generator, with the latest advances in single-loop, fractional-N synthesis. Our years of experience in large-scale integration and surface mount assembly also helped us keep costs down without sacrificing performance.

You can rely on warranted RF amplitude accuracy of  $\pm 1.5$  dB (typical performance is less than  $\pm 1$  dB). The output power level, from +10 to -136 dBm, covers a wide range of devices and components. Rock-solid dc FM with  $\pm 500$  Hz carrier frequency accuracy lets you test pagers with confidence. And don't worry about highly sensitive devices — the HP 8647A's low RF leakage ensures valid measurement results.

**Tough enough to take whatever you can dish out.**

Compare other signal generators in this price range. The weak link in every one is the mechanical attenuator. These relays are one of the major causes of generator failure, and you can't afford breakdowns on your production line.

The HP 8647A signal generator is the only synthesizer in its class with a fully electronic attenuator. With no moving

parts, you get precise repeatability over millions of amplitude cycles. In fact, our engineers compute the mean-time-between-failure rate at 40,000 hours (that's 19 years of eight-hour shifts, in case you're counting).

**And simple enough to make your life a lot easier.**

Performance and features didn't translate into complexity when we designed the HP 8647A signal generator. Independent knobs let you control amplitude and

frequency simultaneously. And clearly labeled key groups for frequency, amplitude, memory, modulation, and data entry make the HP 8647A easy to set up in a hurry.

After you've set up a test, the HP 8647A doesn't forget. Use the 300 storage

registers to keep track of specific instrument settings, and define up to 10 test sequences that easily adapt to any test procedure. In addition, the HP 83300A remote interface provides instant access to stored setups without touching the front panel.

For full automation, slip the HP 8647A signal generator into an HP-IB system. The interface is standard, and the instrument provides both talk and listen capability. And with Standard Commands for Programmable Instruments (SCPI) codes, you make the most of your investment in custom software.

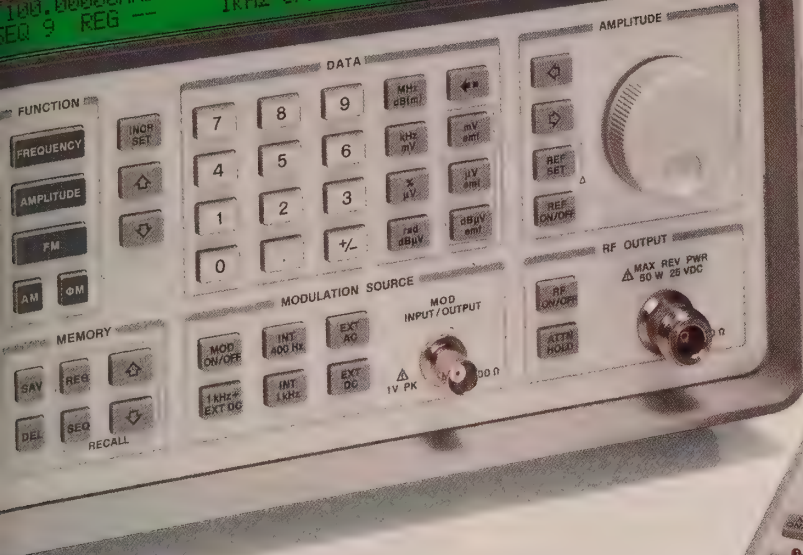
**Even problems are no problem.**

You can count on the HP 8647A, with its MTBF of more than 30,000 hours. If you do have trouble, though, the internal diagnostics locate failures quickly. You can get back on-line quickly by swapping modules on site — and you don't need to recalibrate when you insert a new module.

Learning more  
about the  
HP 8647A  
is simple, too.  
Call HP DIRECT.

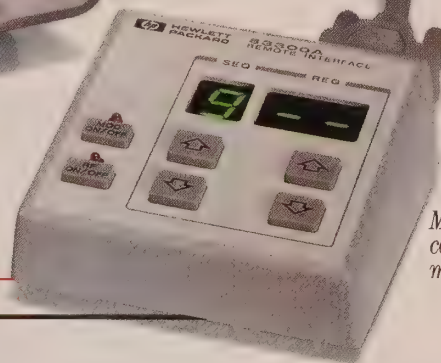
1-800-  
452-4844





\$4,965

*A logically organized front panel makes it quick and easy to identify tasks.*



*Minimal operator input controls up to 300 measurement setups.*

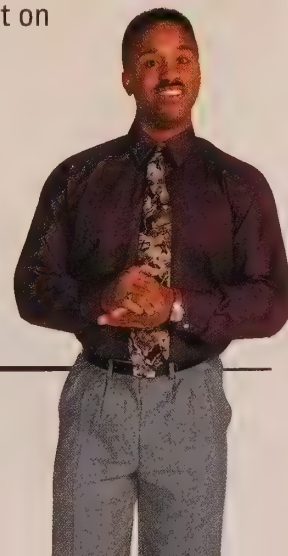
#### HP 8647A Synthesized Signal Generator

<b>Frequency</b>			
Range	250 kHz to 1000 MHz		
Resolution	10 Hz (1 Hz available over bus or remote programming)		
<b>Spectral purity at 500 MHz</b>			
SSB Typical Phase Noise	-110 dBc/Hz @ 20 kHz offset		
Residual FM (CCITT, rms)	<10 Hz, typically <6 Hz; $f_c$ from 249 to 501 MHz <20 Hz, typically <11 Hz; $f_c$ <249 and $f_c \geq 501$ MHz		
<b>Output power</b>			
Range	+10 to -136 dBm; overrange to +13 dBm		
Accuracy	$\pm 1.5$ dB, typically $\pm 1$ dB, +10 to -127 dBm Typically $\pm 3$ dB, <-127 dBm		
<b>Frequency modulation</b>			
Deviation range (for rates >25 Hz ac FM)	0 to 100 kHz pk, for $f_c$ <249 MHz and $f_c \geq 501$ MHz 0 to 50 kHz; for $f_c$ from 249 MHz to <501 MHz		
Resolution	10 Hz for deviations up to 10 kHz 100 Hz for deviations from 10 kHz to 100 kHz		
Deviation accuracy (1 kHz rate)	$\pm 7.5\%$ of FM deviation setting $\pm 30$ Hz		
Rates	Internal: 400 Hz or 1 kHz External: dc to 75 kHz (typical, 3 dB BW)		
<b>Phase modulation</b>			
Deviation range	0 to 10 radians: $f_c$ <249 MHz and $f_c \geq 501$ MHz 0 to 5 radians: $f_c$ from 249 MHz to <501 MHz		
Resolution	0.01 radian		
Deviation accuracy (1 kHz rate)	Typically $\pm 7.5\%$ of deviation setting $\pm 0.05$ radians		
Rates	Internal: 400 Hz or 1 kHz External: 20 Hz to 10 kHz (typical, 3 dB BW)		
<b>Amplitude modulation</b>			
Range	0 to 100%; output $\leq +4$ dBm, $f_c > 1.5$ MHz		
Rates	Internal: 400 Hz or 1 kHz External: 20 Hz to 25 kHz (typical, 3 dB BW)		
<b>Leakage</b>	Typically <1 $\mu$ V as measured with a resonant dipole antenna (nominally 0.1 $\mu$ V with a 2-turn loop)		
<b>Net weight</b>	7 kg (15 lbs)		
<b>Size</b>	165 mm H x 338 mm W x 338 mm D (6.5 x 13 x 13 in)		
<b>Warranty</b>	1 year		
<b>Ordering information</b>			
HP 8647A Synthesized signal generator	\$4,965.00 ea.	Opt. W30 Additional 2-year warranty	\$120.00 ea.
Opt. 0B1 Extra manual set	100.00 ea.	Opt. W50 Additional 4-year warranty	240.00 ea.
Opt. 1E5 High-stability timebase	600.00 ea.	5960-2229 Transit case	925.00 ea.
Opt. 1CM Rack mount kit	72.00 ea.	HP 83300A Remote interface	335.00 ea.
		HP 83301A Memory interface	360.00 ea.

## Choosing the right signal generator.

I can take the confusion out of choosing a signal generator. Describe the signals you need, then we can discuss HP's entire family of signal generators to make sure you get the right combination of features and performance.

We can also discuss ways to improve your test and measurement results when you're using signal generators, whether you're building an automated test system or just using the unit on your bench.



Get the facts you need to solve your measurement problems.

**1-800-452-4844**



# Capture it, display it, document it with HP BenchLink connectivity solutions.

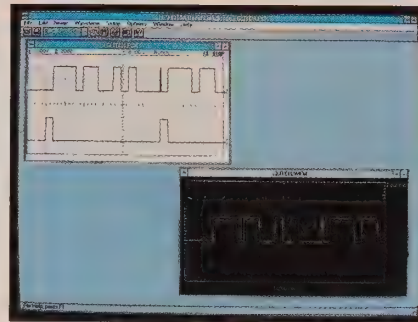
Is communicating measurement results a major part of your job? Documenting tests, verifying compliance, reporting to management — the need to get more from your data never ends.

The HP BenchLink family of PC connectivity solutions makes these tasks easier. You can gather instrument data quickly and use it more effectively, and we've done all the programming for you.

## ***HP BenchLink/Scope***

### **Time to throw out the scissors and tape.**

With HP BenchLink/Scope, it's easy to transfer screen images from an HP 54500- or HP 54600-series scope to your PC. From there, the Windows Clipboard makes it a snap to create polished reports or presentations by moving scope results into your Windows applications with a click of the mouse. And for archiving, just store the images



*With HP BenchLink/Scope, move data and screen images to your PC and use them in any Windows-based application.*

on disk in either PCX or TIFF formats — with time and date stamps, too.

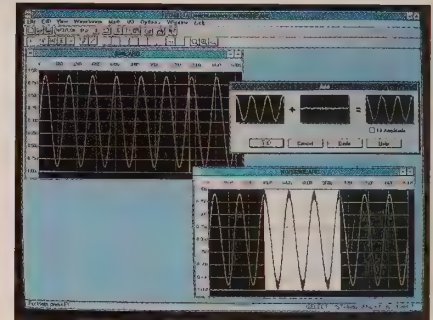
### **Extract more information from your data.**

In addition to screen images, HP BenchLink/Scope lets you transfer the actual waveform data (stored as time/voltage pairs) for analysis in spreadsheets or statistical packages. You can also use scope waveforms as input for arbitrary waveform generation by teaming up with HP BenchLink/Arb.

## ***HP BenchLink/Arb***

### **Creating waveforms is now as easy as drawing a picture.**

HP BenchLink/Arb turns the HP 33120A function/arb generator into a "design studio" for arbitrary waveforms. You can create, edit and download waveforms with the graphical ease Windows has to offer. The drawing palette lets you draw

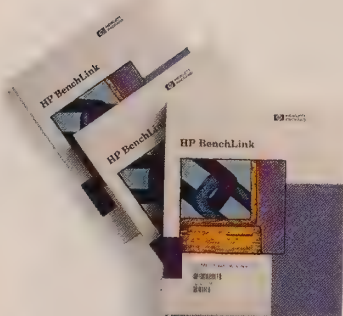


*HP BenchLink/Arb allows you to create your own waveforms and download them to your generator — with Windows ease.*

any shape you can imagine and add noise, pulses, and sine, square, or triangle waves. (No, you don't have to be an artist!)

### **Creating and editing are easy; just choose the method that works best for you:**

- Use the drawing tools to create any waveform your application requires.
- Enter waveforms numerically as user-defined time and voltage data.
- Edit and replay waveforms captured with HP BenchLink/Scope.
- Import time and voltage data in ASCII files. (Imagine this: create a waveform algorithmically in a spreadsheet or math/statistics package, then sit back and watch the HP 33120A generate it as a live signal!)



Starting at \$150

# Receive new product information!

Fill out and mail this business reply card and you'll receive the latest HP Basic Instruments Catalog and regular announcements about new products.

**Don't wait and miss out** — send this card in now to make sure you get up-to-the-minute information about HP basic instruments.

PLACE YOUR MAILING LABEL  
FROM BACK COVER HERE

- ☐ **YES!** Send me the latest HP Basic Instruments Catalog. Please **ADD** me to your mailing list.
- ☐ **UPDATE** my address on your mailing list.
- ☐ Please **DELETE** me from your mailing list.

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Company \_\_\_\_\_ Dept./Bldg. Mail Stop \_\_\_\_\_  
Street Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_ ZIP \_\_\_\_\_  
Telephone: Area Code (\_\_\_\_\_) \_\_\_\_\_ Extension \_\_\_\_\_

## Which of these electronic test instruments do you use, specify, or buy?

- 5709 ☐ Digital Multimeters  
5703 ☐ Oscilloscopes  
5702 ☐ Counters  
5301 ☐ Pulse/Function Generators  
5711 ☐ Bench Power Supplies  
5710 ☐ System Power Supplies  
5706 ☐ Logic Analyzers  
5704 ☐ Meters  
52 ☐ Data/Telecommunications Testers  
5107 ☐ Microwave Power Meters  
5106 ☐ Spectrum Analyzers  
5106 ☐ Network Analyzers  
5501 ☐ Data Acquisition & Control  
5502 ☐ Dynamic Signal Analyzers  
56 ☐ Computer-Aided Test Software  
☐ Other \_\_\_\_\_

## Which of the following describes your role in the purchase and use of test and measurement instruments?

- 3 ☐ I use these products in my job.  
91 ☐ I am a purchasing agent.

## Check the occupation which most closely describes your work:

- 11 ☐ Electrical Engineer  
12 ☐ Mechanical Engineer  
15 ☐ Industrial Engineer  
1B ☐ Production Engineer  
1E01 ☐ Engineering Technician  
54 ☐ Purchasing Agent  
51 ☐ Administrator  
3 ☐ Information Systems  
71 ☐ Teacher/Professor/Trainer  
21 ☐ Scientist/Researcher  
☐ Other \_\_\_\_\_

## Check the department in which you work:

- 32 ☐ Research & Development  
31 ☐ Manufacturing  
33 ☐ Quality Assurance  
36 ☐ Equipment Maint./Calibration  
26 ☐ Purchasing  
21 ☐ General Mgmt./Admin.  
41 ☐ Sales  
42 ☐ Marketing  
43 ☐ Service/Support  
53 ☐ Education/Training  
☐ Other \_\_\_\_\_

## Check the title which best describes your position:

- 1 ☐ Board Member/President/Owner  
21 ☐ Vice President/Other Officer  
22 ☐ General/Functional Manager  
23 ☐ Middle Manager/Dept. Head  
24 ☐ Supervisor/First-Level Manager  
31 ☐ Project Leader  
32 ☐ Individual Contributor/Staff  
☐ Other \_\_\_\_\_

## Check the industry that best describes your company at your location:

- MANUFACTURING  
32 ☐ Industrial Machinery & Equipment  
33 ☐ Computer & Peripheral Equipment  
35 ☐ Communications Equipment  
36 ☐ Electronic Components  
37 ☐ Automotive & Other Transport  
38 ☐ Aerospace/Defense Equipment  
39 ☐ Instrument Manufacturing  
3A ☐ Consumer Electronics

## SERVICE

- 74 ☐ Electronic Equipment Rental  
71 ☐ Software Development/Data Processing  
72 ☐ Research & Development Labs  
82 ☐ Education

## GOVERNMENT/OTHER

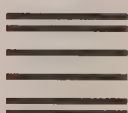
- 91 ☐ Government, Federal & Other  
92 ☐ Government Defense  
☐ Other \_\_\_\_\_

## Number of employees at your business location:

- 1 ☐ 1-99  
2 ☐ 100-499  
3 ☐ 500-999  
4 ☐ 1,000-4,999  
5 ☐ 5,000-14,999  
6 ☐ Over 15,000

**9145**





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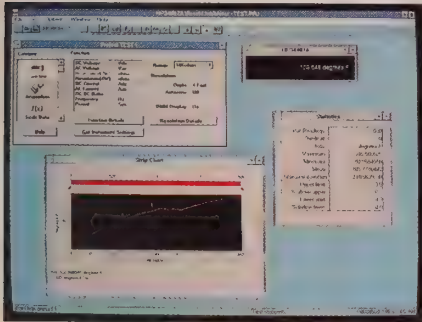
**Hewlett-Packard DMO  
HP DIRECT TMO  
PO BOX 50068  
PALO ALTO CA 94303-9513**



## HP BenchLink/Meter

**Push your data to the next level of performance.**

Precision and flexibility are a powerful combination. You'll get precision data from the HP 34401A digital multimeter or the HP 53100-series counters and flexibility from HP BenchLink/Meter and Windows. With the instrument data on your PC, you can create graphs, move



*HP BenchLink/Meter adds a new visual dimension to your DMM or counter data, making it easy to graph, tabulate and store results.*

test results into a variety of Windows applications, catalog test results, and perform basic statistical analysis — without writing a single line of code.

### **Increase the value of your DMM or counter.**

When it's easy to gather test data and easy to get more information from your data, your test results become more valuable. Especially when you can use the HP multimeter or counter that you already own.

HP BenchLink/Meter's ability to configure and run tests from the PC makes data gathering a breeze. It's easy to follow and evaluate incoming data with the strip chart display and limit test features. Plus, you'll discover how quick and simple trending and data comparison become with the statistics and archiving tools. All of which means you've increased the value of your instruments — and your time.

## Products that fit the way you'd really like to work.

Does this sound familiar?

You need to modify a circuit, but you don't want to pull out your soldering iron before you know you have the right solution. With HP BenchLink/Arb to replay waveforms captured with HP BenchLink/Scope, it's easy to perform "what if" analysis without making actual circuit changes. Capture a live signal, mix in some noise, then use the HP 33120A to inject the new test signal back into your circuit. You can test the design change before you do anything drastic. This is just one of the many powerful things you can do with HP BenchLink.

To make things as easy as possible, the HP BenchLink series runs on any 386 or better PC with Microsoft Windows 3.1 or later, with either the RS-232 or HP-IB interfaces (both HP and National Instruments IEEE-488 cards are supported).

### **HP BenchLink**

#### **Ordering information**

#### **Requirements**

- 386 or 486 AT-compatible computer
- Serial port (COM 1, 2, 3, or 4), or IEEE-488 card (HP 82335A/B, HP 82340/41A, or National Instruments AT-GPIB, AT/TNT, or GPIB-PC)
- 4 MB or more RAM
- MS-DOS 4.01 or later
- Windows 3.1 or later
- MS-compatible mouse
- 3.5" high-density floppy drive
- 2 MB disk space

HP 34810A	BenchLink/Scope	\$295.00 ea.
HP 34811A	BenchLink/Arb	295.00 ea.
HP 34812A	BenchLink/Meter	150.00 ea.
HP 34820A	BenchLink Suite*	395.00 ea.

Each HP BenchLink package includes a 3.5" disk and User's Guide.

\*This software suite includes HP BenchLink/Scope/Arb and Meter.

Microsoft Windows is a U.S. trademark and MS-DOS is a registered trademark of Microsoft Corporation.

We can answer any questions about computer requirements, data compatibility, or HP-IB interface cards.

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**Within budget,  
without compromise.**



# Automation as fast as it is affordable.

Add world-class test automation  
for as little as **\$395** — including  
Windows software!

## Put big-league automation on your benchtop.

Test engineers have been relying on HP-IB (IEEE-488) for years, and now you can have it with the ease and simplicity of Windows. Control instruments, transfer results, and use PC software to analyze your data — at a price you probably didn't think was possible.

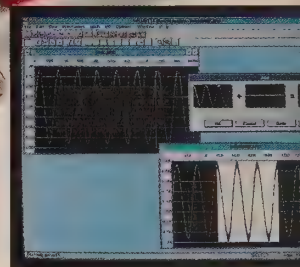
## Pick the optimum level of performance.

The high-speed HP 82341B provides built-in buffering for fast I/O, making it perfect for demanding applications and multi-instrument systems. The mid-range HP 82340A is ideal for single-task applications with a dedicated PC. And

the versatile HP 82335B is the right answer for DOS setups, particularly where you want compatibility with existing programs.

## Pull it together with test automation software.

The Standard Instrument Control Library (SICL) for Windows 3.1, included with all three cards, provides a comprehensive library of instrument I/O functions to simplify your code development. The HP Command Library, included with the HP 82335B, supports both DOS and Windows operation.



*You can control any HP-IB instrument  
from your Windows application.*



*Efficiently develop test programs  
for most programming languages  
right from your PC.*

HP 82335B HP-IB Card, HP 82340A HP-IB Card, and HP 82341A High-performance HP-IB Card

	HP 82335B	HP 82340A	HP 82341A
<b>Operating system</b>	DOS, Windows 3.1	Windows 3.1, Windows NT	Windows 3.1, Windows NT
<b>I/O Library*</b>	Command Library, Standard Instrument Control Library	Standard Instrument Control Library	Standard Instrument Control Library
<b>Languages</b>	C, Pascal, BASIC incl. Visual Basic	C/C++, Visual Basic	C/C++, Visual Basic
<b>Backplane**</b>	ISA/EISA (8 bit)	ISA/EISA (8 bit)	ISA/EISA (16 bit)
<b>Max. I/O speed</b>	355 KB/sec	520 KB/sec	750 KB/sec
<b>Optional buffering</b>	No	No	Yes
<b>Warranty</b>	1 year	1 year	1 year
<b>Ordering information</b>			
HP 82335B HP-IB card for Windows and DOS	\$445.00 ea.	HP 82341B High-performance HP-IB card for Windows	\$495.00 ea.
HP 82340A HP-IB card and SICL for Windows 3.1	395.00 ea.	Opt. NT1 Upgrade to support Windows NT	195.00 ea.
Opt. NT1 Upgrade to support Windows NT	195.00 ea.		

\*Applications written using the HP 82335B Command Library software will not run on the HP 82340A or HP 82341A.

\*\*One ISA/EISA slot required.

Microsoft Windows is a U.S. trademark and MS-DOS is a registered trademark of Microsoft Corporation.

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Nobody's been doing HP-IB longer than the people who invented it, so you can count on HP for practical, productive solutions.

Start with the hardware. You won't find any other standard interfaces for test automation that are this affordable or this easy to install.

Next, the software libraries bundled with these cards give you a head start on instrument control, I/O, controller communications, and the other program functions you'll need.

And if you need help, the HP PC T&M Helpline has experts standing by the phone.

HP-IB from the experts at HP: it's the difference between selling you a collection of parts and making sure you have a complete solution.



## High-quality HP cables with just one phone call.

### HP-IB Cables

Product No.	Description	Length	Price
HP 10833A	HP-IB cable	1 m (3.3 ft)	\$90.00 ea.
HP 10833B	HP-IB cable	2 m (6.6 ft)	100.00 ea.
HP 10833C	HP-IB cable	4 m (13.2 ft)	110.00 ea.
HP 10833D	HP-IB cable	0.5 m (1.6 ft)	90.00 ea.
HP 10834A	HP-IB to HP-IB adapter	*	35.00 ea.

\*Provides additional clearance between HP-IB cable and rear panel of instrument.

### HP 50 $\Omega$ Coaxial Cables

Part No.	Description	Length	Price
8120-1838	2 BNC (m) connectors	30 cm	\$19.50 ea.
8120-1839	2 BNC (m) connectors	61 cm	20.00 ea.
8120-1840	2 BNC (m) connectors	122 cm	23.50 ea.
11000-60001	Dual banana plugs	112 cm	30.00 ea.
11001-60001	One UG-88 C/U BNC (m) conn. and one dual banana plug	112 cm	30.00 ea.

### HP RS-232 Cables

Product No.	Description	Length	Price
HP 34398A	9 pin (f) to 9 pin (f) plus 9 pin (m) to 25 pin (f) adapter	2.5 m (8.2 ft)	\$20.00 ea.
HP 24542G	25 pin (m) to 9 pin (f)	3 m (9.8 ft)	45.00 ea.
HP C2913A	25 pin (m) to 25 pin (f)	1.2 m (3.9 ft)	18.00 ea.
HP C2914A	25 pin (m) to 25 pin (m)	1.2 m (3.9 ft)	18.00 ea.
HP 34399A	Adapter kit (contains 4 adapters): 9 pin (m) to 25 pin (m) for use with PC or printer 9 pin (m) to 25 pin (f) for use with PC or printer 9 pin (m) to 25 pin (m) for use with modem 9 pin (m) to 9 pin (m) for use with modem		26.00 ea.

### HP RS-232 Selection Guide for Basic Instruments\*

Instrument	PC or Printer Connector		
	25 pin male	25 pin female	9 pin male
HP 54600-series with HP 54652B/59B <sup>1</sup> , HP 34401A <sup>1</sup> , HP 33120A <sup>1</sup>	HP 34398A	HP 34398A + HP 34399A	HP 34398A
HP 53131/32/81A <sup>2</sup>	HP 34398A	HP 34398A + HP 34399A	HP 34398A
HP 54600-series with HP 54651A/58A <sup>3</sup> , HP 54656A <sup>4</sup>	HP C2913A	HP C2914A	HP 24542G

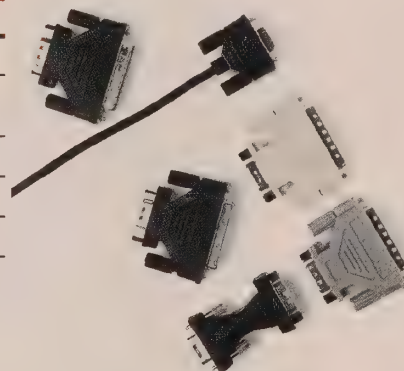
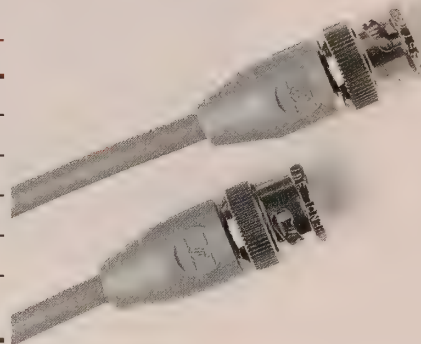
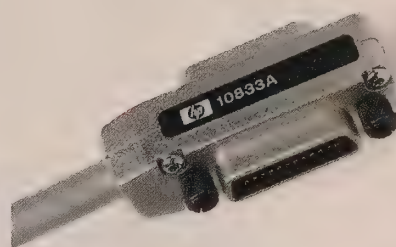
<sup>1</sup>Instrument connector is 9 pin (m).

<sup>2</sup>Instrument connector is 9 pin (m) and is a talk port only.

<sup>3</sup>Instrument connector on module is 25 pin (f).

<sup>4</sup>Instrument connector on module is 9 pin (f). Must use included 9 pin (m) to 25 pin (f) adapter.

\*This table recommends the compatible RS-232 cable to use when connecting basic instruments in this catalog to a PC or printer.

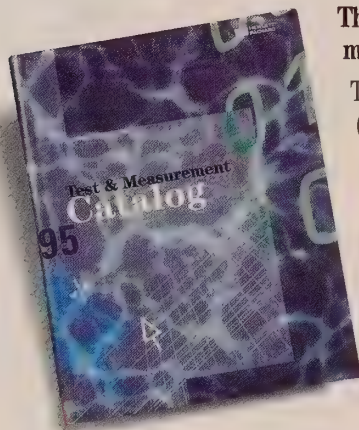


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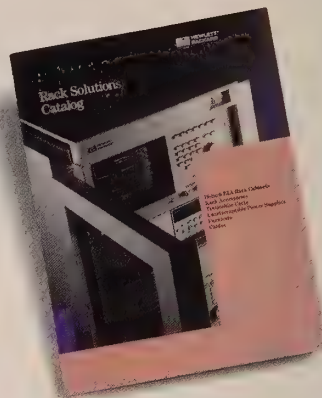


# Free catalogs for HP test and measurement products.



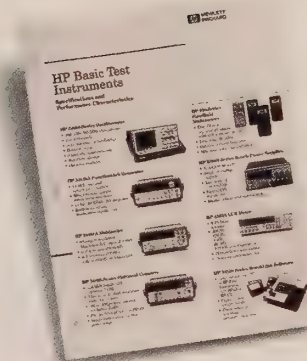
**The complete guide to all HP test and measurement products.**

The 1995 Test & Measurement Catalog (HP pub. #5962-0220EUS) contains information on all HP analyzers, sources, communication test equipment and systems products (including VXIbus systems, board test, semiconductor test and system controllers). In addition to product data, you'll find information about customer service, financing, leasing and rental.



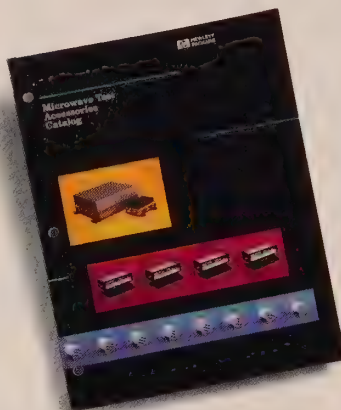
**Organize your instrumentation with an HP rack system.**

The Rack Solutions Catalog (HP pub. #5963-1052EUS) highlights all the racks, adapters and accessories you need to build an efficient test and measurement system. You'll find information on 19-inch EIA racks, HP Testmobile carts, cables and accessories, uninterruptable power supplies, and furniture. The catalog also describes HP's system integration services and provides helpful guidelines for configuring rack systems.



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**From adapters to waveguides, the complete catalog of microwave accessories.**

The Microwave Test Accessories Catalog (HP pub. #5091-4269EUS) provides all the data you need on all of HP's microwave accessories, including detectors, cables, filters, step attenuators, noise sources, probes, and switches.

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# Ordering Information

## Ordering

---

### Where and when to call

Call 1-800-829-4444 any weekday between 8 a.m. and 5 p.m. in any U.S. time zone. We serve all 50 U.S. states. Residents of Puerto Rico should contact their nearest HP sales office.

### Have ready when you call:

- Your company's purchase order number so we may reference it on your order.
- Your VISA, MasterCard or American Express card and expiration date for credit card orders.
- Your HP account number and your code number (both found on the mailing label if you received your catalog by mail).

## Shipping

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### Free surface delivery

Our prices include regular surface freight delivery by carrier of our choosing. This includes inside delivery and special handling.

## Payment

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### To open an account

It's easy. Just give us your company billing and shipping addresses and a purchase order number. We'll give you an account number in minutes.

### Credit cards

We accept VISA, MasterCard and American Express.

### Terms

Net 30 days from invoice date for HP account customers. Open account terms are subject to credit approval.

### Delivery charges

Our prices include regular surface delivery. Charges for any special types of delivery will appear separately on your invoice.

## Pricing

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### Effective date

Prices are net, effective November 1, 1994, and are valid in virtually all cases.

### Discounts

We honor all HP quantity and corporate discounts. For GSA discounts, call the Federal Business Center, 1-800-468-8347.

### Catalog errors

HP reserves the right to correct printing errors and change prices.

Only HP Corporate Price List prices, as listed at the time your credit-approved order is placed, are applicable.

## Problem Solving

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### Money-back guarantee

If you are not satisfied for any reason, return your purchase in original condition within 60 days for a full refund or credit.

### Billing questions

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Returns are simple — just call 1-800-829-4444 for return instructions. Our HP Customer Administrator Representatives will ensure your problem is resolved promptly. They can either make a sales adjustment or give you return instructions.

Please provide us with the HP sales order number found on your packing slip, the product number, and the quantity damaged.

Some limitations apply on returns of operating manuals.

### HP sales office phone numbers

To get the telephone number of your local HP sales office, call 1-800-452-4844.

## Warranty

---

HP hardware products are warranted against defects in materials and workmanship. If you send us notice of such defects during the warranty period, we will either repair or replace hardware products that prove to be defective.

Our software and firmware products that are designated by us for use with a hardware product are warranted for a period of 90 days to execute their programming instructions, when properly installed. If you send us a notice of defects in materials and workmanship during the warranty period, we will repair or replace these products, so long as the defect does not result from buyer-supplied hardware or interfacing. The warranty period is controlled by the warranty statement included with the product and begins on the date of shipment.

This warranty shall not apply to any defect, failure, or damage caused by improper use or improper or inadequate maintenance and care. This warranty is exclusive and no other warranty, whether written or oral, is expressed or implied. HP specifically disclaims the implied warranties of merchantability and fitness for a particular purpose.

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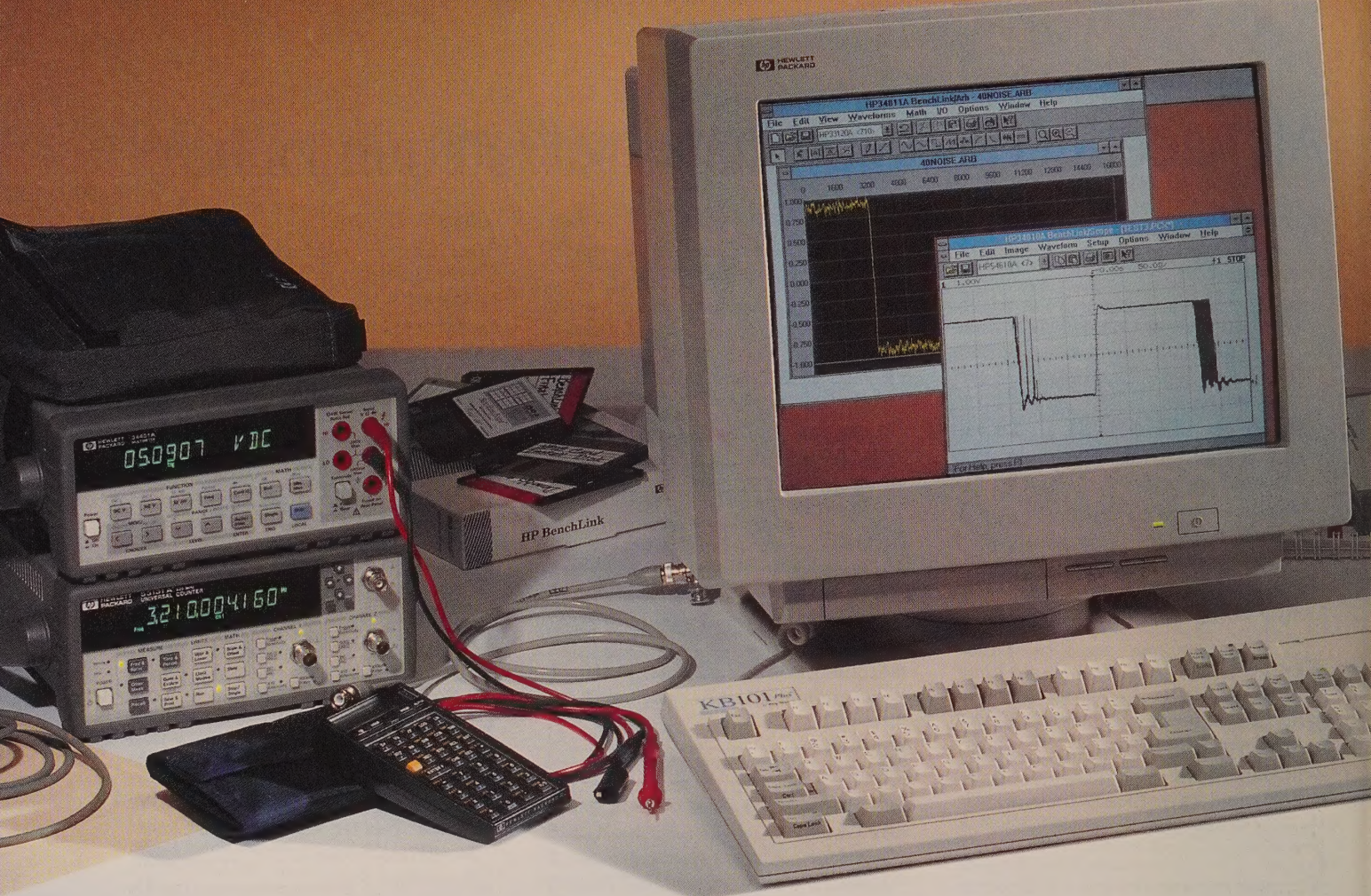
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If evolving technology isn't pushing your need for greater performance, the competition is. Trouble is, you can't always buy new equipment every time your needs increase. The question is, what are we doing about it?

The HP 54600-series of scopes is one example. We've created modules that let you add additional capabilities like FFT or test automation. The result is that you can easily transform a basic scope into a powerful test and measurement tool. Inexpensively.

And the HP 33120A function/arb generator. HP-IB and RS-232 interfaces are standard so that you can move from bench applications today to a system tomorrow. Built-in flexibility for future changes.

These are just a couple of ways HP protects your equipment investment while helping you respond to new challenges.

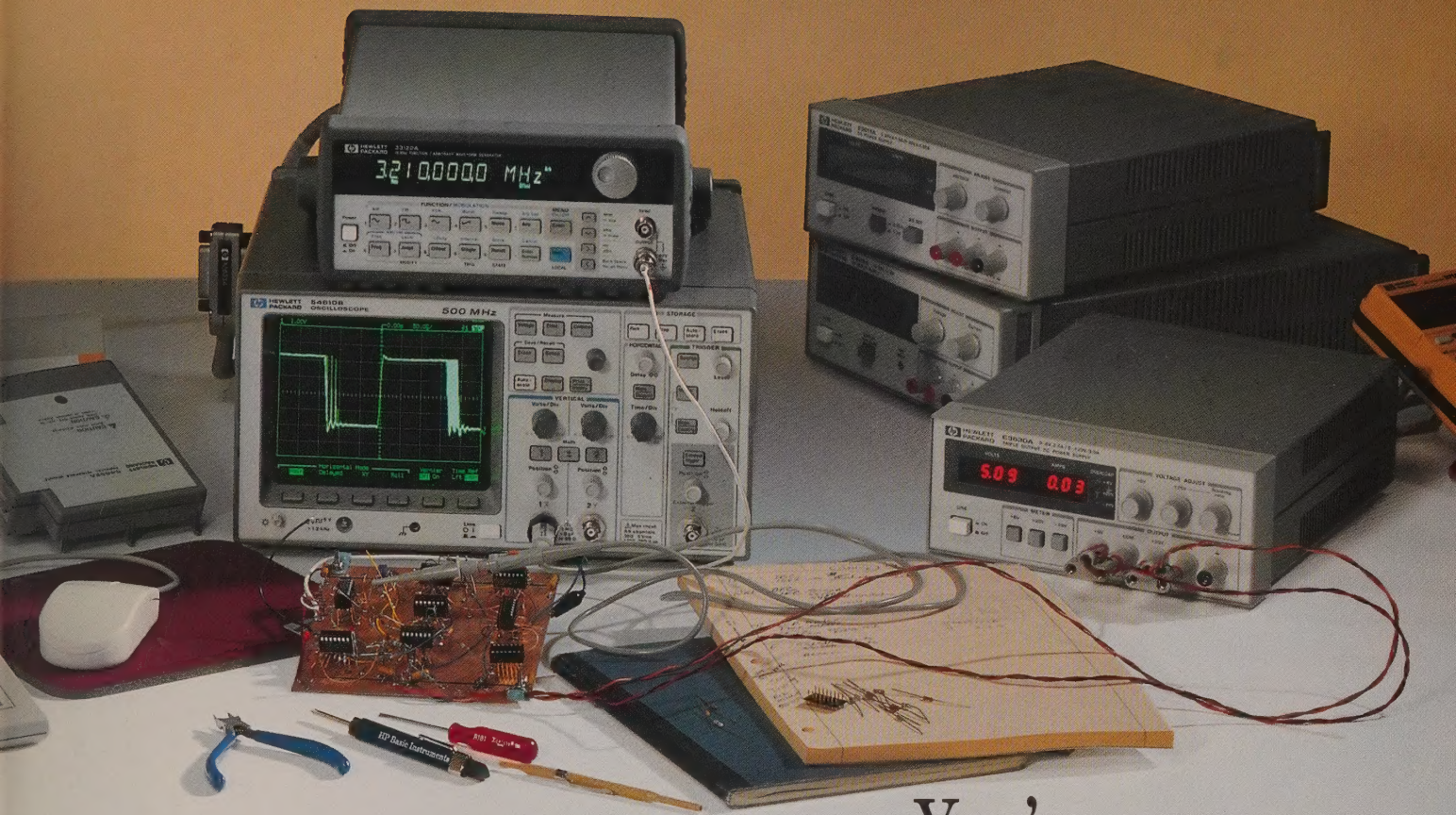
**You need to find ways to fully utilize the power of the equipment you already have.**

Squeezing more personal productivity out of less time and money may seem impossible. But it's not. It just requires a different way of approaching the problem. One way is to utilize the strengths of the tools you already have.

One thing we've done is create HP BenchLink, unique software products that allow you to link your PC with your HP 54600-series scope, your HP 33120A function/arb generator, your HP 34401A digital multimeter, or HP 53100-series counters.

The net result: you can now add the power of your PC to get capabilities like reporting data directly from your scope or to generate different kinds of waveforms with your function/arb generator. This is just another example of how we've been able to dramatically boost your productivity at a very undramatic price.





**You can't afford to have the little details of your equipment causing big problems.**

We've spent a lot of time watching how people like you use instruments. And it's amazing that so much of your energy is spent on figuring out how to deal with your test equipment instead of just taking your measurement. We're doing something about that.

Like dedicating front panel buttons on the HP 34401A DMM to the most important functions, rather than burying them in layers of softkey menus. Or giving you three convenient ways to input data on the HP 33120A function/arb generator. Or an analog display mode on the HP 53100-series counters to make limit testing quick and simple.

### **Flashy engineering breakthroughs?**

Not always. But they're always designed around your needs and the day-to-day reality of your job. See what we mean about "Within budget, without compromise"? It's not just about products. It's about addressing the real challenges you face. And giving you what you really need to succeed.

You've seen  
how you  
can assemble  
a better, more  
affordable  
workbench.

Here's how  
to make it  
smarter.

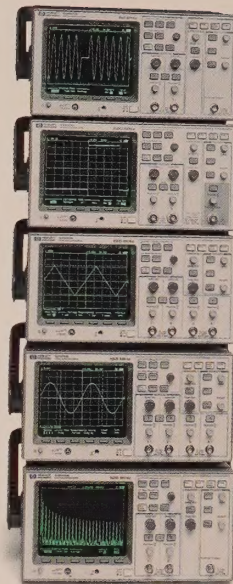


# For every measurement, instruments that are within budget and without compromise.

**HP 34401A**  
**Digital multimeter.**  
6½ digit multimeter at the price  
of 5½ digits. **Page 16.**



**HP 970-series and HP E2373A DMMs.**  
Benchtop features in a handheld.  
**Page 18.**

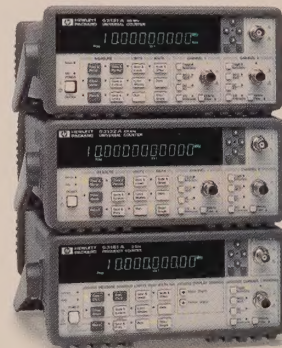
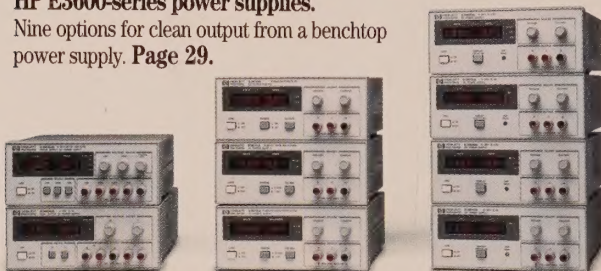


**HP 54600-series oscilloscopes.**  
Analog feel and digital power. **Page 4.**

**HP 54520A and HP 54540A**  
**oscilloscopes.** 500 MHz scopes that  
let you see more of your signal. **Page 8:**



**HP E3600-series power supplies.**  
Nine options for clean output from a benchtop  
power supply. **Page 29.**



**HP 53131/32/81A 225 MHz**  
**counters** that offer 10 to 12  
digit/sec resolution. **Page 22.**



What kind of waveform do you need?  
See our function generators.  
**Page 24** for the **HP 33120A.**  
**Page 28** for the **HP 8116A.**



**HP 54620A logic analyzer.** **Page 12.**  
**HP 1664A logic analyzer.** **Page 14.**

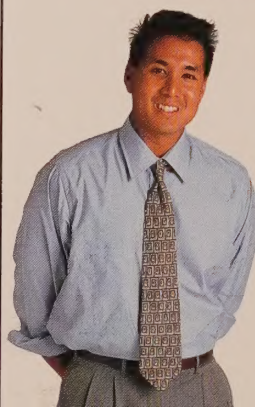


**HP 437B power meter.** **Page 36.**  
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